

Half title wanting.

A
TREATISE
ON
SURGICAL DISEASES,
AND THE
OPERATIONS SUITED TO THEM.

BY BARON BOYER,

Member of the Legion of Honour, Professor of Surgery of the Faculty of Medicine of Paris,
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National and Foreign learned Societies, &c. &c.

TRANSLATED FROM THE FRENCH

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WITH NOTES, AND AN APPENDIX,

BY THE TRANSLATOR.

VOL. I.



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ANNEX

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District of New-York, ss.

BE IT REMEMBERED, That on the ninth day of December, in the fortieth year of the Independence of the United States of America, *Alexander H. Stevens*, of the said District, hath deposited in this office the title of a book, the right whereof he claims as Proprietor, in the words following, to wit: "A Treatise on Surgical Diseases, and the Operations suited to them. By Baron Boyer, Member of the Legion of Honour, Professor of Surgery of the Faculty of Medicine of Paris, Principal Adjunct Surgeon of the Hospital de la Charité, Member of several National and Foreign learned Societies, &c. &c. Translated from the French by Alexander H. Stevens, M. D. Professor of the Principles and Practice of Surgery in the Medical Institution of New-York, and of Queen's College, New-Jersey; one of the Consulting Physicians of the New-York Dispensary, &c. With Notes, and an Appendix, by the Translator. Vol I."

In conformity to the Act of the Congress of the United States, entitled, "An Act for the Encouragement of Learning, by securing the Copies of Maps, Charts, and Books, to the Authors and Proprietors of such Copies, during the time therein mentioned;" and also to an Act, entitled, "An Act, supplementary to an Act, entitled, An Act for the Encouragement of Learning, by securing the Copies of Maps, Charts, and Books, to the Authors and Proprietors of such Copies, during the times therein mentioned, and extending the benefits thereof to the Arts of Designing, Engraving, and Etching Historical and other Prints."

THERON RUDD,

Clerk of the Southern District of New-York.

TRANSLATOR'S PREFACE.

THE character of Baron Boyer, as a practical surgeon, and as a surgical writer, is without rival on the continent of Europe. His work on the Bones, which was long since translated into English, is justly ranked among the medical classics. The high encomiums that have been bestowed upon these volumes, and the want of a comprehensive System of Surgery adapted to modern practice, sufficiently explain the Translator's motives in offering this Work to the public.

Men of great celebrity are commonly so absorbed in the practice of their profession, that the world is usually indebted to others for the publication of their opinions. Baron Boyer is a happy exception to this remark, and his System of Surgery will, it is believed, enjoy the same rank in the nineteenth century, as those of Celsus, Heister, and Benjamin Bell, when they were severally published.

It is probably not unknown to many American physicians, that the jealousy and rivalry of the French and English surgeons have extended to the remotest ramifications in medical science. Instead of estimating, with reciprocal cordiality, their respective suggestions, they seem, in many cases, purposely to pursue different tracts, without any wish to approach, or to improve each other. This remark must have struck every per-

son who has compared the doctrines and practice of the schools and hospitals of London and Paris.

Having one language in common with the English, (which affords ground for prejudice in literary and scientific pursuits, scarcely possible to be duly estimated) the American physicians, so far as their practice is not peculiar to themselves, have derived it almost exclusively from Great-Britain. Hence, the reader will not be surprised to find, in the writings of Boyer, much that is different from, and even opposite to, his previous impressions. It is not hazarding much to say, that as we have rarely done justice to the continental sc̄avans in our comparative view of their merits, it is believed, we may fairly expect of all that is new in the present Work, much that may be properly engrafted into our own system. The Translator has endeavoured to give an impartial view of the comparative merits of French and English practice; and, by combining the improvements of his own country, he hopes to present to the reader a well digested System of modern Surgery.

In regard to the Translation itself, it will be found to convey the spirit rather than the letter of the Author's writings. Conciseness and perspicuity have been aimed at, and four volumes of the original are compressed into two. The principal part of the Translator's Notes are placed at the end of each volume, as well to distinguish them from those of the Author, as that the continuity of the Work might not be interrupted.

New-York, December, 1815.

AUTHOR'S PREFACE.

SURGERY has been cultivated from the earliest antiquity, with more or less success ; but it has made the greatest progress of late years, and seems now to have attained all the perfection of which it is susceptible. The phenomena and curative indications of almost all Surgical Diseases are, at present, perfectly understood ; in many instances we are able to trace them to their proximate causes, and, of course, to understand their essential characters. The modes of operating are fixed and described with a precision which leaves little room for improvement : our instruments and apparatus have become more convenient in proportion as they have been simplified ; and if any thing yet remain to be done in this last respect, it is rather in improving old instruments than in inventing new. The catalogue of external remedies, long crowded with a mass of useless articles, has undergone a reform not less important. The external applications now in use, have, in consequence, been studied with more care, and their effects upon the human body have been more exactly ascertained.

These improvements, due, for the most part, to the labours of the Royal Academy of Surgery, and those of some men formed by this celebrated association, have rapidly rendered obsolete the complete Systems of Surgery published in the course of the last century : thus students are obliged to consult a great number of books for the attainment of knowledge, which they would acquire with much greater facility in a systematic work.

The desire of obviating this difficulty, has led me to incorporate into a body of doctrine, the Lectures, which I have delivered for more than twenty years past, upon External Pathology and the Operations of Surgery.

The plan of the Treatise which is now offered to them, differs in no way from that which I have uniformly followed since I have devoted myself to the teaching of Surgery. I divide Surgical Pathology into two parts. The first relates to diseases which may appear upon any part of the body. In this class I consider Inflammation in general, Abscess, Gangrene, Burns, Wounds, Tumours, Ulcers, Fistulæ. and Diseases of the Bones, which are divided into those of continuity and contiguity.

In the second part I have strictly followed an anatomical order. This part embraces all that relates to diseases which may be considered as peculiar to any particular organ, or as presenting remarkable peculiarities by reason of their situation. Thus I shall treat successively of Surgical Diseases of the Head, Neck. Chest, Abdomen, and Extremities.

As most of the diseases which require the aid of Surgery strictly so called, that is, manual operations, belong to this second division, they will be regularly described in this part of the Work. We shall commence with some general remarks upon Surgical Operations, by way of introduction. It is not, however, my intention that this Work should comprehend a complete Treatise on Operative Surgery. I once had this in view, but I saw that it would be an undertaking of immense extent. The work of M. Roux is perhaps the best on this subject.

It will be remarked, that the plan of this Work differs very little from that which has generally been followed by systematic writers on Surgery, and especially by Fabricius ab Aqua Pendente, and Heister. This method has the advantages of being almost universally adopted, and extremely simple.

I will not deny that this plan wants unity, inasmuch as the diseases belonging to the first division are classed ac-

cording to their characters, and those belonging to the second division, according to their seats. To obviate this objection, I designed at first to have treated of diseases altogether according to their anatomical situations; but I found this would lead to endless repetition, and to the separation of subjects that are intimately connected with each other.

Medical diseases admit of being classified more or less perfectly. Whatever opinion we may entertain of Nosology, so far as relates to practice, no one can deny that it aids the memory, and facilitates the study of Medicine. But we have no need of such aid in the study of Surgery. Surgical diseases, however numerous, present such well marked characters, that it is not easy to confound them, even when they are known only by description; moreover, they have so little resemblance to medical diseases, that they have not hitherto been included in any nosological arrangement, except as a distinct class.

I have studied less to systematize surgical diseases, than to give an exact description of the individual maladies,—to indicate the different aspects under which they may appear, and to consider successively their different periods;—in a word, to present a succession of descriptions of their remote and proximate causes, their symptoms, complications, and terminations.

The particular History of Diseases will be followed by an Account of their Treatment. After stating what relates to Regimen and the Use of Medicines, I shall speak of the Operations, describing those which I think best, with all the necessary details; I shall point out those which I think good, and omit the rest.

I shall studiously avoid dwelling upon idle theories, by means of which it was thought, not long since, all the mysteries of nature might be unraveled.

I shall say nothing of the History of Surgery; it would be out of place in a didactic Treatise. The reader must not expect to find the precise date of each discovery, nor the

names of the inventors. I shall teach what is proper to be done, not what was recommended at this or that period. At the same time, I have not neglected to consult all the best surgical writers: the *Memoirs of the Academy of Surgery* have been extremely useful to me.

Having practised Surgery more than four-and-twenty years, I might easily have confirmed each precept by cases which have occurred to me; but, fearing to render my work too voluminous, I have related only such cases as appeared to me to present some remarkable peculiarity of novelty and utility.

The small number of new ideas which are contained in the present Treatise, has been already published by my pupils, either in their Inaugural Theses, or in more extended works. Some of them not having given me credit for what they derived from my Lectures, I might urge a right to claim what is my own; but the only value of any discoveries I may have made, is the utility that may result from their being made public. What is the difference, then, by what voice they have been proclaimed?—I should have passed by this subject in silence, were it not that I might be suspected of plagiarism, in announcing my own discoveries.

Although this Treatise is intended chiefly for students, I venture to hope that it may not be uninteresting to practitioners: that it may be useful, is my only wish.

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A SYSTEM OF SURGERY.

CHAPTER I.

Of Inflammation.

INFLAMMATION is of the number of those diseases of which the nature is unknown, and which, of course, can be defined only by a succinct exposition of the symptoms which characterize them.

We say a part is inflamed when it is red, swollen, painful, tense, and warmer than in its natural state.

The word inflammation is derived from the resemblance between the phenomena which it presents, and those produced by a strong heat upon any part of the living body; and, in fact, this resemblance is perfect. Let the hand, for instance, be placed near a burning coal; the first sensation will be that of a strong heat, accompanied with itching, and with a slight stinging, which soon amounts to pain. If the exposure to heat continue, the part becomes red; it swells, and presents, in fine, all the characteristics of inflammation. Hence the physicians of all countries have preserved the analogy between the characteristics of inflammation and the effects of heat upon the animal economy, and in every language the word which corresponds to the French word inflammation, expresses the same idea. Among the Greeks this affection was designated by the term *φλογωσις*, from *φλέγω*, I burn; among the Latins, by that of *inflammatio*. It must not, however, be forgotten, that the word inflammation is a term purely abstract, used to designate that combination of phenomena which occur in an inflamed part.

The seat of inflammation is in the cellular tissue, and especially in the very minute vascular net-work formed by the ramifications of the arteries, whether these vessels carry red blood, or admit only that which is white. It follows, that inflammation may affect all parts in which there is found a capillary vascular net-work spread on cellular membrane.

First in the class of parts liable to inflammation we should

reckon the cellular tissue, properly so called, which is situated under the skin, and unites it to the parts beneath; and, second, the skin, an extremely complex membrane, which presents in its structure a prodigious quantity of vessels, and an infinite number of nervous filaments, to which it owes its extreme sensibility.

Serous and mucous membranes claim the second place.

Next follow the viscera, which are the more susceptible of inflammation, in proportion to the quantity of cellular tissue which enters into their composition, and the density of their vascular net-work. Hence the lungs being very vascular and cellular, are much more obnoxious to inflammation than the liver and other viscera. But every viscus, not excepting the brain, in which anatomists have not yet demonstrated cellular tissue, may be affected with inflammation. The muscles, the large vessels, the nerves, the tendons, the ligaments, the cartilages, and the bones themselves, may inflame.

It is proper to make a distinction in regard to tendons. Those which are long, thin, dry, and which receive no other vessels than those which enter them from the fleshy part of the muscles, do not appear to us susceptible of inflammation. Such are the flexor and extensor tendons of the fingers. Thus we see in the whitlow the tendon of the finger affected remains untouched, while the cellular tissue suppurates in consequence of the high inflammation which it has undergone. When the whitlow has been opened too late, we find the tendon completely insulated, and of a natural colour. The presence of air excites no inflammation, and exfoliation becomes necessary.*

But the larger tendons, surrounded by cellular membrane, which insinuates itself into the interval of the fasciculi, of which they are composed, are susceptible of inflammation. This is the reason why the two ends of the tendo achillis, when cut across, inflame, and are covered with fleshy granulations, when care has not been taken to re-unite the wound by a suitable position and bandage. There is one circumstance, however, in which tendons of this latter kind do not inflame; it is when they have been deprived of their cellular tissue, as takes place, for example, in the phlegmonous erysipelas, where this tissue has been destroyed by gangrene or suppuration. Exfoliation then becomes necessary. But if denuded by a simple wound, without being entirely deprived of their surrounding cellular tissue, they quickly become

* See note A at the end of the volume.

covered with red granulations, and do not exfoliate. The same is true of aponeuroses.

The epidermis, the nails, and the hair, never inflame. Anatomists have never detected in them sanguineous vessels.

Inflammation receives different names, according to the part it affects. Thus, when it affects the eye, it is called *Ophthalmia*; when it attacks the throat, *Quincy*; when the lungs are affected, it is termed *Peripneumony*; when the liver is the seat of inflammation, it constitutes *Hepatitis*, &c.

Inflammation is varied in its progress and intensity by sex, age, temperament, season, and climate. It runs through its different stages with a velocity proportioned to the degree of vitality in the part affected, and the energy of the exciting cause. Hence it is distinguished into acute and chronic. We see a striking example of difference in the rapidity of its progress in the bones and cellular tissue. In the former it seldom terminates in less than several months; in the latter it advances with great celerity.

There is an infinite variety in the intensity of inflammation in the same part. Thus, in the diseases of the skin, there are numberless grades, from the smallest pimple to the most alarming erysipelas. In those of mucous membranes how many varieties are there between a slight catarrh and cynanche maligna! What difference in the violence of peripneumony!

The seat of inflammation is greatly influenced by age. Infancy is most obnoxious to diseases of the skin, lymphatic glands, and mucous membranes. Hence the frequency of eruptions of every kind, glandular swellings, and catarrhs.

The viscera of the chest suffer peculiarly at the age of puberty, and commencing manhood. At these periods of life peripneumonies and pleurisies are more frequent. When manhood is established and declining, inflammations (at other times rare) attack the abdominal viscera. Then we see enteritis, dysentery, hepatitis, nephritis, inflammation of the spleen and hæmorrhoids.

In old age all parts suffering alike, no one seems more liable to inflammation than the rest.

It is observed, that women are more subject to lymphatic inflammations than men.

In cold seasons and northern climates peripneumonies, catarrhs, and rheumatic affections are much more common than in warm seasons and climates, where the most frequent inflammatory affections are dysenteries and cutaneous diseases.

Beside the differences which inflammation presents in its progress, intensity, and seat, it is distinguished into idiopathic or essential, and symptomatic or accidental, as when it is complicated with wound or fracture, &c.

The causes of inflammation, like those of other diseases, are proximate and remote.

The proximate cause of inflammation is the afflux of blood and its *engorgement* into the capillaries of the part affected. Several theories have been formed to account for the afflux of blood into an inflamed part. Of these theories, which are all hypothetical, that of Boerhaave is the most celebrated. As it was once generally adopted, and as it continues to be taught in several schools, it will be proper to explain it. For this purpose some anatomical details, purely speculative, are necessary.

According to Leeuwenhoek, who first made microscopical experiments on the animal economy, a globule of blood is composed of six yellow globules, which last are themselves formed by the union of six serous globules; so that the compound globules may be divided and reduced to the state of simple ones.

Boerhaave concluded, from the experiments of Leeuwenhoek, that there must exist in the vascular system as many series of vessels as there were orders of globules in the blood. He contended, therefore, 1st. That each capillary sanguineous artery, when it had reached its end, divided into two branches, of which one continued into a vein, and the other was the principal trunk of a lymphatic artery. 2d. That each lymphatic artery divided, in like manner, into two branches, of which one formed a lymphatic vein, the other the principal trunk of a serous vessel. He even went so far as to admit the existence of spirituous vessels, which arose from the division of the serous. According to him the branches of the different vessels are conical, and receive in their healthy state those globules only which are proportioned to their diameter. Thus the red globules do not pass into the sanguineous vessels, and the lymphatic vessels admit only yellow globules. Serous vessels give passage only to serous globules. But when a red globule, by any force whatever, is introduced into a vessel not destined to receive it, this globule, unable to advance by reason of the conical form of the vessel, is arrested, and causes an obstruction of blood in this part. The blood stopping in the vessels leading to the part first affected, becomes accumulated; and this accumulation giving rise to what Boerhaave termed *error loci*, caused inflammation. This system, which is really

very plausible, was received so much the more readily during the author's life-time, as most of the physicians of that day explained, by the laws of mechanics, the functions of the animal economy. But we shall soon see, that supposing the obstruction to exist, it cannot cause inflammation; and, secondly, that *error loci* does not take place.

1. The sanguineous vessels have numerous anastomoses. The same must, therefore, happen when obstruction takes place, that occurs when a ligature is put round an artery, i. e. the blood must pass through the collateral vessels.

2. If obstruction occasioned inflammation, its progress ought to be from the obstructed part toward the heart. On the contrary, we see that it usually extends equally in all directions from the centre. It many extend in any one direction.

3. If inflammation arose from obstruction, we should never be free from it, for our vessels are compressed when we sit, when we lean on an elbow, &c. yet this compression does not occasion inflammation. How many patients do we see resting a long time in a posture which compresses the vessels of a part, without inflammation resulting from it!

4. It is impossible to explain by obstruction the inflammation which attacks the skin from a prick, or the sting of an insect. It would be absurd to say in any case that obstruction existed anteriorly to the prick. It is clear then that this theory, built on a sandy foundation, falls by its own weight.

As to the theory of *error loci*, that is to say, of the passage of sanguineous globules into lymphatic vessels, it rests upon the hypothesis of the immediate communication of the sanguineous arteries with the system of the lymphatics. But if such communication did exist, by throwing mercury into the sanguineous arteries, we should make it pass into the lymphatic absorbents. Now this has never been accomplished without a rupture of vessels, which allowed the mercury to escape into the cellular tissue: there exists, therefore, no direct communication between the arteries and the lymphatics. Moreover, the microscopical experiments of Leeuwenhoek have been repeated several times by observers, who have seen in the blood no other globules than red ones. There exists, however, in some inflammations a phenomenon which seems to favour the idea of *error loci*: for instance, when a part naturally white, and in which the eye can discover no red vessel, becomes inflamed, it assumes a red colour, more or less deep, which might be attributed to the passage of red blood into the lymphatic vessels. But in all

parts, even those that are whitest, the blood circulates, and its globules preserve the red colour which is essential to them. Now, since the sanguineous vessels of these parts are extremely delicate, and receive, so to express it, only single globules, they do not show a red colour; in the same manner a drop of coloured liquor in a transparent capillary tube, or a plate of coloured glass extremely thin, appears white.

But if several globules of blood united enter successively a vessel through which they do not pass in the natural state, they will show through the thin transparent walls of this vessel their red colour in a manner precisely similar to the several united drops of coloured liquor in a transparent tube. In this way the sclerotica, the skin, and in general all parts of the body which are naturally white, become red in inflammation. There is no need of recurring to *error loci* in order to explain this phenomenon, which is, beside, disproved, as we have seen, by anatomical experiments. What then is the proximate cause of inflammation? Is it, as some think, a spasm of the arteries of the affected part? This state of spasm does not accord with the phenomena of the disease. Shall we, with others, have recourse to a particular disposition of the body that has been called the inflammatory diathesis? This disposition does not at all explain the development of the disease, and we see inflammation occurring in those whose diathesis is the reverse of inflammatory. The most general opinion of the present day is, that inflammation is produced by irritation. In fact, the phenomena of inflammation seem to occur from an irritation which stimulates the parts affected. This explanation is due to Van Helmont; but it originated with the ancients, even with the father of medicine; for when he says *ubi dolor ibi fluxus*, he says in an explicit manner what is true, that the irritation attracts the humours, and produces swelling in the part into which they flow. The name *fluxions*, which Hippocrates gives to inflammatory affections, expresses the same idea. But what the ancients had only foretold, the moderns have demonstrated by actual experiment. They have seen, that when the mesentery of a frog is irritated by a sharp instrument, and exposed to the focus of a solar microscope, the blood flows from all parts towards the irritated point, and gets there even contrary to its usual course, i. e. by retrograding in certain vessels until it reaches the centre of irritation. This irritation, excited on the mesentery of a frog, if continued long enough, will produce inflammation. The phenomena of inflammation accord perfectly with the account which has just been given. If a part be stung by a

wasp, it begins to redden; and as the inflammation is kept up by the sting, or by the secreted fluid it has left, the redness speedily increases, the part swells, and these phenomena extend from the centre to the circumference. Every inflammation is developed, and progresses in the same manner. There is constantly a *nucleus* of engorgement, or centre of irritation, whence the symptoms spread in all directions—the fluids tend from all parts to the centre of the irritated part—the swelling increases and assumes a circular form; sometimes undefined, as in erysipelas; sometimes circumscribed, as in phlegmon. Thus the phenomena of inflammation unite with microscopical experiments upon living animals, to prove that irritation is the proximate cause of inflammation.

But how does this cause act upon the parts to produce inflammation? It is hardly possible to determine this point. All we can infer from observation is,

1. That irritation draws the blood from all points of the circumference to the centre of the irritated part. This afflux of blood produces the dilatation and augmentation of the action of the arteries—sometimes even their rupture, and the extravasation of blood into the cellular tissue.

2. That the irritation is not confined to the nerves of the part inflamed—that it extends to the sanguineous vessels of this part, in which it excites an agitation and oscillation, which are manifested sometimes by pulsations, that did not take place in the natural state.

3. That the irritation, while it attracts the humours, augments the action of the solids of the part inflamed in such a manner that the vital action becomes stronger in the part, and is more manifest to our eyes by the clearer development of the phenomena which characterize it. In fact, the heat, the redness, the inflammatory tension, announce an augmentation of the vital powers, and the organic action of the capillaries.

The remote causes of inflammation are occasional or predisposing.

The occasional causes are every thing which can produce irritation. They are divided into external and internal. The external occasional causes are either chemical, as fire, caustic, corroding substances, such as the different concentrated acids, cantharides, &c. or mechanical, as wounds of all kinds, contusions, violent distortions, foreign bodies, such as pieces of iron, wood, and splinters. The occasional internal causes are either the fluids depraved by excessive or irregular action of the vessels, or the products of some secretion

taken by absorption into the circulating mass; or emanations previously diffused in the atmosphere, and introduced into the body through the medium of respiration, digestion, or the cutaneous surface, and mixed with the fluids. It may be inferred from this, that the nature of the internal occasional causes of inflammation is unknown. The ancients called occult, those causes whose effects did not tally with the relations of heat, cold, moisture and dryness, to which they attributed most diseases: and this language was a sincere avowal of their ignorance of the nature of these causes. The explanations given by the moderns have not at all advanced science; their hypotheses have been abandoned by the ingenuous; and now, when inflammation appears without apparent reason, they are content to say it arises from an internal cause. In this case the disease is often preceded by a greater or less disturbance in the animal economy, an augmentation of the action of the arterial system, which seems to show the efforts of nature to free itself from a morbid principle which affects it, and to purify the mass of fluids. This is what is observed in erysipelas, small-pox, measles, and in all exanthematic diseases.

It is of great moment to determine, if an inflammation arise from an internal cause or an external, because it would do as much injury to interrupt the progress of the disease in the former case, as to promote it in the second.

The action of the causes which we have just detailed, although of itself sufficient to produce inflammation, is, nevertheless, favoured by a disposition of the solids and fluids existing in many individuals. Persons, for example, of a sanguine temperament, an athletic constitution; those who have imprudently suppressed any habitual evacuation, those who eat nourishing food, and drink immoderately of spirituous liquors, are much disposed to inflammatory affections. A strong predisposition to these attacks has been termed the inflammatory or phlogistic diathesis. It has been remarked, that in persons thus circumstanced, the blood contains a larger proportion of fibrin and eruer than in other temperaments. It is probably on this account that the liquid is more disposed to produce engorgements in parts where the irritation attracts it.

The symptoms of inflammation, when not considerable, and when it attacks external organs of little sensibility, are limited to the local phenomena which we have already enumerated, i. e. redness, swelling, increase of heat, and pain more or less acute. But besides these symptoms, inseparable from inflammation, there are others also arising from

the peculiar nature and functions of the organ affected, especially when this organ is very sensible, internal, and essential to life, as the brain, the lungs, &c. When the inflammation is considerable, and even when moderate, if it depend upon an internal cause, the disease is then accompanied with general constitutional derangement. We proceed to examine successively the three orders of symptoms : 1. Local symptoms. 2. Particular symptoms, depending upon the nature of the organs affected. 3. General symptoms.

Redness is an invariable attendant on inflammation. When the part affected is external, this redness is visible. When the inflammation is seated in an internal part, the redness is not apparent ; but it exists notwithstanding, as is evident from the dissection of the bodies of the persons who have died of any inflammatory affection, as for example, of peripneumony, pleurisy, peritonitis, &c. The mechanical physicians attributed the redness to the passage of blood into vessels not intended to receive it, i. e. to *error loci*. But in refutation of this, we have demonstrated, that the symptoms of which we speak depend upon the agglomeration of several globules of blood, in vessels where they previously entered only one by one. The redness, not very remarkable in the first instance, increases as the inflammation progresses. When it has reached its maximum, the redness is so considerable as to approach the colour of violet. This is observed in carbuncles, certain phlegmona, and in erysipelas approaching to gangrene.

Swellings constantly occur in inflammations, as well external as internal ; but like the redness, it is not apparent in the latter cases. Sometimes, however, it is apparent externally in certain inflammations of the abdominal viscera, as for instance, in hepatitis.

This tumour is proportioned to the intensity of the disease, to the quantity of blood accumulated in the inflamed part, and to the greater or less laxity in the texture of the inflamed part. Sometimes it is elevated and circumscribed, as in phlegmon ; sometimes undefined, and not much projecting, as in erysipelas ; sometimes it consists in a thickening only, as in inflammatory affections of the serous membranes and hollow viscera.

In every inflamed part there is an increase of heat, and this is very sensible to the hand of an observer when placed upon it ; and this is remarkable because it does not always affect the thermometer. It prevents many varieties in different organs, and does not always agree with the sensations

of the patient. Thus the burning heat that is felt in erysipelas, does not present the same character to the hand of the physician applied to the part.

Pain is one of the principal phenomena of inflammation. It is often the only one by which internal inflammations are discovered; nevertheless, every internal pain does not arise from inflammation; for the nervous colic is not an inflammatory affection.

The pain presents many varieties, as well in its intensity as in its character; its degree is usually in proportion to the sensibility of the organ affected, and to the greater or less density of its tissue. Thus it is very trifling when seated in loose cellular tissue. It is extremely acute in whitlow, which is situated in the ends of the fingers, where the cellular tissue is dense, compact, and the nervous filaments very numerous. There is, however, one case in which the pain is very acute in parts in which anatomy has not yet detected nerves, and which, in their healthy state, are insensible. Thus the pain is often very severe in inflammations of the articulations, bones, &c.

As to the character of inflammatory pain, it differs in every organ. In the skin it is very sharp and biting, as is remarked in erysipelas; it is acute and throbbing in the cellular tissue; dull and heavy in the glands; gravitating in the lungs; sharp and pungent in serous membranes; contusive and deep seated in the bones.

The local phenomena characteristic of inflammation which have just been considered, do not always follow in the same regular order. Sometimes the pain precedes the other symptoms, as occurs in pleurisy and other internal inflammations. Sometimes it commences with redness, as we observe in isolation. But it is very rare that tumefaction precedes the other symptoms, although it is observed to do so in certain affections of the jaws, called *fluxions*; the particular symptoms depending upon the nature of the organ affected, have their seat at the part inflamed, and relate to the functions of this organ, or they occupy parts more or less remote, which have a sympathy with it. Each of these cases may be illustrated by appropriate examples. When inflammation attacks the brain, or its membranes, and delirium and convulsions supervene, and if it terminate in suppuration, the patient falls into a lethargy, which announces his speedy dissolution. In inflammation of the organ of hearing, there is *tinnitus aurium*, and sometimes delirium, by reason of the connection of this part with the brain. A patient affected with ophthalmia cannot look at objects,

However dim they may be; the least light gives pain to his eyes.

When inflammation is situated in the organs of deglutition, it is accompanied with difficulty of swallowing.

If it affect the larynx, the voice becomes sharp and hissing, and the respiration difficult. Oppressive cough and spitting of blood are the peculiar symptoms of peripneumonia.

Nephritis, or inflammation of the kidney, is accompanied with a retraction of the testicle; hepatitis, with pains in the shoulder and in the larynx; whitlow, with inflammation of the axillary glands.

The general symptoms which supervene in certain inflammations, are often confined to the acceleration of the pulse, and an augmentation of the heat throughout the whole body, i. e. to the phenomena of simple fever. But, according to the nature of the organ inflamed, the degree of inflammation, and the state of the patient, the fever is greatly varied, and sometimes it is accompanied with severe head ache, frequent respiration, and a diminution of several excretions. Thus the perspiration is diminished, the urine is emitted in small quantity, and at other times it is limpid. All this announces a state of constriction of the vessels of the kidneys.

When fever precedes inflammation, as in eruptive diseases, it may be considered as an effort of nature to expel a morbid principle. When, on the contrary, the febrile commotion is preceded by the phenomena of inflammation, as in inflammations arising from external causes, it appears to be owing to the irritation communicated from the inflamed part to the different systems in the animal economy, and especially to the sanguineous system. Boerhaave attributed the fever that attended inflammation to the efforts of the heart to overcome the obstacle presented by the obstructed vessels of the part inflamed. But if the obstruction of a certain number of vessels produce an augmentation of the action of the heart and arteries, it is difficult to conceive why, under many circumstances in which the blood passes with difficulty through a great number of vessels, no evidence of fever exists. For example, in the operation for aneurism of the crural artery, the trunk of this artery, obstructed by the ligature, must form a very great obstacle to the blood. Nevertheless, we often see this operation followed by little or no fever, while the slightest inflammation of the brain, or of its membranes, is ordinarily followed by a high fever, which is no way proportioned to the supposed obstruction in the inflamed part. Besides the

different phenomena of inflammation which have just been detailed, it is to be observed, that this disease occasions a change in the quality of the fluids, and especially of the blood. In fact, when we bleed in the commencement of the disease, the blood is much thicker than natural, and almost all this liquid forms a coagulum, and a small quantity of serum only is separated from it; which proves that the proportion of fibrin is augmented; afterwards there is formed on the surface of the clot, a yellowish white stratum, partaking sometimes of the green, and which has been called the buffy, or pleuritic coat.

The thickness of this stratum is commonly proportioned to the intensity of the inflammation, and it is in general more considerable at the second and third bleeding than at the first. This inflammatory coat seems to depend upon a particular modification of the fibrin; but it is not so constant that the practitioner can draw from it any induction relative to the treatment of the disease.

The symptoms of inflammation are its diagnostic signs. When it is external, its local symptoms sufficiently characterise it; but when it is internal, the pain, the fever, and the symptoms peculiar to the organ affected, are the only signs by which we can recognize it.

The prognostic of inflammation varies according to a great number of circumstances. In the first place, the seat of the disease makes a great difference in its consequences. Thus an external inflammation is much less dangerous than an internal. Moreover, inflammatory affections are more or less dangerous, according to their intensity, their extent, the nature of the organs inflamed, their sensibility, and the importance of their functions.

Inflammation may terminate in five different ways, viz. by delitescence, by resolution, by suppuration, by induration, and by gangrene. We give the name delitescence to a sudden disappearance of inflammation, without going through its different periods. For example, when a person burns himself with hot water, without however the epidermis detaching itself, if we plunge the part thus injured into cold water, or acetate of lead dissolved in water, and leave it there for a certain time, we prevent the effect of the irritation, and give to the fluids an impulse different from that which it has occasioned, and thus render the disease abortive. It often happened when a gonorrhœa has been suppressed by any cause, that the testicle swells and becomes painful. In this case, if we apply speedily upon the tumour a discutient cataplasm, we repel the humours which are advancing

to it, and arrest the inflammation; the running recommences, and the disease pursues its ordinary course. The quick cessation of the inflammation in these two cases, are genuine examples of delitescence. Often it is not followed by any new inflammation, or any derangement of the functions of the animal economy. It is then an advantageous termination, as we observe in inflammations produced by any external cause, as a puncture, a burn, or a sprain. But sometimes the inflammation, in quitting the part which it at first attacked, goes immediately to another, and this change of place has received the name of inflammatory metastasis. It is most frequently observed in inflammations from an internal cause, and may be favourable or otherwise, according to the parts in which it takes place. Metastasis is favourable when it goes from an internal to an external part, or from a part in which inflammation is dangerous, to one in which it is not so. But it is unfavourable whenever the inflammation is translated to organs more important than those which it previously occupied. We read in the *Memoirs of the Royal Academy of Surgery*, that the use of astringent gargles in inflammations of the throat, has brought on a fatal peripneumony; and it is not rare to see the termination of erysipelas by delitescence give rise to a pleurisy or some other dangerous complaint.

Different explanations have been given of metastasis. According to some it takes place through the medium of inosculating vessels. Others, with Bordeu, believe that the morbid principle transports itself from one place to another through the medium of the cellular tissue. Finally, there are some who explain it by saying, that the blood accumulated by the effect of irritation in the part primarily inflamed, is drawn to another part by a stronger irritation. The opinion of Bordeu seems the most probable.

Resolution is the gradual dissipation of inflammation. It is distinguished from delitescence, inasmuch as in the latter the disease is arrested all at once in its progress, and even in its commencement; while, in resolution, it is only dissipated by degrees, and when it has arrived to a certain height, so that it goes through its different periods. Thus, from the time when resolution takes place, irritation ceases in the part. The engorged vessels receive a smaller quantity of fluids, and resume their natural diameters. The order of the circulation is re-established, and we see the phenomena of inflammation disappear slowly and by degrees.

Resolution may take place in every inflammation; sometimes when the disease depends on an internal cause, it is

accompanied with a simple evacuation, either from the bladder, the skin, or the intestines, but most commonly without any sensible evacuation.

Resolution is the most favourable termination; it leaves the parts in their natural state, and in the free exercise of their functions; and even when the disease depends on an internal cause, as it goes through all its different periods, this cause is so elaborated in the course of the inflammation, that it loses entirely its injurious qualities. There is one exception, however, to make in this respect, in favour of inflammations, which supervene upon certain malignant and pestilential fevers, because, in fact, the cause of these kinds of inflammation being extremely deleterious, cannot, so far as appears, be neutralized by the work which is effected in the inflamed part, and might become very injurious to the economy if it were carried back into the torrent of the circulation by resolution. But in all other circumstances, this termination is advantageous and desirable, especially when the disease is internal.

When inflammation does not progress with great rapidity, and the pain is not pulsating, we may hope for resolution. And if the symptoms abate after having increased for a time, it is a sign that nature is bringing about this termination. In external inflammations, resolution commences ordinarily from the fourth to the ninth day. Suppuration is the formation in an inflamed part of a liquid more or less white, unlike all the other fluids in the body, and known by the name of *pus*. This liquid presents many varieties, according to the intensity of the inflammation, and the nature of the inflamed parts.

When inflammation is seated in the cellular tissue, the matter of suppuration is white, and slightly yellowish, homogenous, opaque, of the consistence of cream, without acrimony or smell. These qualities are usually enumerated as appertaining to good pus, or that of healthy formation. When it is formed in the cellular tissue, or in parenchymatous organs, as the liver, the lungs, it collects in cavities produced by the separation of the neighbouring parts, and which have been called *depots*. The collections which form these, constitute what is termed an abscess, of which we shall treat in a separate chapter.

When inflammation attacks a mucous membrane, and it is moderate, the mucus secreted by the follicles, which enter into the composition of this membrane, becomes very abundant. It becomes thick, and finally assumes the form of a fluid, of a greenish yellow colour, which is called puri-

form matter, on account of its resemblance to pus. This is what we observe in inflammation, of the mucous membrane, of the nasal fossæ, of the larynx, the trachea, the bronchia, the vagina, the urethra, the urinary bladder, and, in general, of all membranes which line the interior of hollow organs.

If inflammation be seated in serous membranes, such as the peritonæum, the pleura, the arachnoides, we observe, when it is violent, that a lymphatic exudation takes place, which thickens and becomes hard, and by means of which the membranes affected with inflammation contract adhesions, more or less strong, with the neighbouring parts with which they were previously in contact. Thus we see, after pleurisy, the external surface of the lungs adheres to the pleura costalis, and the abdominal intestines present the same phenomenon, relative to the abdominal parietes. The inflammation of these membranes is carried to a still higher degree; it makes a sero-lymphatic exudation, which presents a different colour, according to the rapid or slow progress of the disease. If the inflammation be very high, this liquid is the colour of blood, and often contains flocculi of a cellular appearance. If it be chronic, as we frequently see it, in the abdominal intestines of scrofulous persons, the exuded liquid resembles whey, in which we frequently discover cellular flocculi.

The product of suppuration presents also a variety in the other organs. The pus of the muscles is of a greyish yellow; that of the liver is reddish, thick, and mixed with yellow streaks. That of the bones is thin, fœtid, and greyish, and often imparts a black colour to the linen and lint. Finally, it varies in these different parts, according to the progress of the disease, the state of the individual, and the remedies employed. That of the cellular tissue is not always identical in the commencement of the suppuration; it is thin, serous, and reddish; or what is designated under the name of sanguineous sanies. In cold abscesses, where the inflammation is hardly sensible, it remains very liquid, and assumes sometimes a greenish colour.

Suppuration is an advantageous termination where the inflammation depends upon an internal cause, which is very active, and when, at the same time, it is situated externally. In fact, in this case it is to be feared, that the elaboration which takes place in the course of the disease, were it to terminate in any other manner, would not modify sufficiently the injurious qualities of its cause to hinder them from injuring the economy.

But in all other inflammations, without excepting those which are external, suppuration is a disadvantageous termination, and we ought to endeavour to prevent it, since the disease is only connected into another by forming an abscess.

It is especially in internal inflammations that we are to fear suppuration; and the danger of this termination is greater or less, according to the nature of the organ affected. Suppuration of the dura mater, and of the brain, is always fatal. Nevertheless, when the brain is laid open, we sometimes see the suppuration advance outwards, and the disease terminates favourably. Suppuration of the organs contained in the chest is very often fatal; that of the heart is uniformly so; that of the lungs almost always; but there are some exceptions in cases of suppuration of the pleura.

Suppuration of the abdominal viscera is also very dangerous, and very often mortal. We see, however, abscesses formed in the substance of the liver advance outwards, and undergo a successful opening by art.

Opinions are singularly divided on the mechanism of suppuration. Some authors think that pus is formed in all parts of the arterial system, and that it is deposited as an excretion in the inflamed part. This is the opinion of De Haen, and is detailed in his *Ratio Medendi*. But it is founded upon no fact, upon no observation. Moreover, were pus formed in the arteries, it ought to be produced in all inflammations, which is not the case. Such an hypothesis is not then admissible.

The more general opinion is, that pus is formed in the inflamed part. But by what substances is it formed? Some think it proceeds from the destruction of the solids of the inflamed part. But were it so, this part ought to suffer a loss of substance proportioned to the quantity of pus that is formed, which is not true. On the contrary, when an abscess, even a very considerable one, has been observed, its sides insensibly approach, and we do not perceive in the product of suppuration the smallest trace, either of cellular tissue, or of any other solid; and the cicatrix is formed without any loss of substance. A succession of blisters, applied for several years, produces abundant suppuration. If we cease to apply them, the blistered surface heals up; we see no traces of it, and no loss of substance has taken place.

The opinion of others, and that which appears to us most probable, is, that pus is the product of the fluids of all kinds, which form an inflammatory swelling. Pringle, Galen, and their partisans, to explain the mechanism of its formation, supposed a chemical combination of the fat with the lymph

which exudes from inflamed parts; but this hypothesis is entirely abandoned, and the best pathologists of our days regard pus as the product of a particular elaboration of the humours which flow to an inflamed part, produced by the organic action of the vessels of this part. Suppuration is formed then in an inflamed part, as salivation in the salivary glands, urine in the kidneys, bile in the liver, &c. and as the qualities of the secreted fluids are different, according as the action of the secreting glands is increased, diminished or altered, so the pus varies according to the modifications of the action which the parts undergo. In fact, when inflammation is moderate, but sufficient to elaborate the humours, and convert them into pus in the course of ten or twelve days, this liquid has then the qualities which give it the name of laudable. If the inflammation be carried to too high a degree, the pus is sanious and bloody. If, on the contrary, it be slow, if the symptoms be not well marked, then the pus is very serous, and resembles whey. We constantly see this relation between the qualities of the pus and the degrees of inflammation in wounds, ulcers, &c.

There are some symptoms of inflammation which lead to the presumption, that it will terminate in suppuration; and there are others which announce that it is forming; others that it is formed. These symptoms deserve the closest attention of the practitioner. Let us consider what they are in external phlegmonous inflammation.

When the inflammation has progressed rapidly, when in a short time it has attained a very high degree, when the pain is pulsating, and when the inflamed part is furnished with a great quantity of fat and cellular tissue, then we may presume that the disease will end in suppuration.

If the pain become less intense, and continue pulsatory at the same time, the swelling, the redness, and the heat diminish; if the patient have chills, and a sort of horripilation; if the tumour soften by degrees, we judge that nature is at work in the formation of pus.

When all the inflammatory symptoms, and especially the redness, have greatly diminished, if the tumour be soft in the centre, and pointed, if we can perceive in it a fluctuation, while the rest of its surface is flattened, there is then no doubt that there is pus in the centre of the swelling.

It is very easy to know when pus is forming, or formed, when the inflammation is situated below the skin; but it is difficult to be certain of it when inflammation is situated deeply in the interstices of the muscles, beneath the strong aponeuroses which surround the limb. Often suppuration

exists for a long time without our having a certain knowledge of its presence. But if it be difficult to ascertain the existence of pus formed in deep seated external inflammation, it is much more difficult when it is situated internally. We can then have recourse only to the rational signs, such as pulsating pain, irregular chills, a kind of horripilation, the change of the pulsating pain into that which is gravitating, and the diminution of the other inflammatory symptoms.

Sometimes, however, internal inflammation shows itself externally, and presents local signs, as certain as if it were situated externally. For example, when an abscess of the liver, in consequence of an inflammation of its convex surface, or when the pus, which is generated in a violent peripneumony, points outwards, and forms a fluctuating tumour, &c.

When inflammation is very intense, or when it arises from a malignant cause, it may terminate in gangrene. This termination may take place in any part, but it is most common in inflammation of the skin and cellular tissue.

Gangrene of an organ essential to life is uniformly fatal, and in every case it is very serious, as it destroys the part affected. There are, however, certain inflammatory affections of a very malignant nature, in which gangrene is the only favourable termination. For we observe in these diseases, when there is not energy enough in the system to produce mortification, the patient invariably dies, unless art happily second the efforts of nature by the proper remedies.

We confine ourselves at present to pointing out this particular termination of inflammation, because gangrene forms a particular disease which may arise from other causes, and we shall therefore treat of it in another chapter.

The hardening of inflamed parts, which constitutes that termination which is termed induration. When it is about to take place, the inflammatory congestion, after having diminished a little, remains stationary; the part becomes hard; the redness, heat, and pain, are gradually dissipated; and as these symptoms diminish, the hardening gradually appears. This termination is peculiar to slow chronic inflammations, which are not intense enough to terminate in suppuration. It is most frequent in glands, especially in the testicles. It often arises also in certain cutaneous affections, especially on the borders of ulcers of the lower extremities. Induration likewise supervenes to inflammation of the cellular tissue. We see examples of it in the callosities which follow the course of several kinds of fistu-

læ, and among others, those about the bladder and rectum. They are caused by an inflammatory affection too slight to create suppuration, and which could not be resolved by reason of the continued irritation of substances passing through the fistulous canal.

These callosities, and those which take place in the vicinity of certain ulcers, do not usually produce any other bad effect than that of retarding the cure of these diseases.

But the induration of glandular organs is much more serious, because it always leads to the necessity of taking away the affected part.

There are, nevertheless, some cases in which induration is a termination preferable to suppuration, and particularly to gangrene. For example, in inflammation of the liver, unless the abscess appear externally, so as to be opened, there is no hope of cure.

Art employs different means to combat inflammation in its commencement, and there are others to which it has recourse when the disease inclines to one or the other of the five terminations we have enumerated.

The first are diet, internal and external remedies. By diet is not meant merely the privation of aliment, but the well directed application of what are improperly called the six non-naturals, viz. air, aliment, sleep, and watching, the excretions evacuated or retained, and the passions of the mind.

Too warm air is injurious in all kinds of inflammation, by rarifying the liquids and the solids; excessive heat may even produce the disease.

Too cold an atmosphere tends to constrict the solids and to repel the fluids from the circumference to the centre. It is therefore very injurious in inflammatory affections.

Hence we should, as far as possible, keep patients affected with inflammation in an atmosphere of moderate temperature.

The use of aliments ought to be regulated both in respect to their quantity and their quality.

When the inflammation is very extensive, and it occupies an important organ, such as the brain, the lungs, or any of the abdominal viscera, we should interdict the use of all aliment whatsoever, especially if the patient have a robust constitution. But if he be weakly, we may prescribe some broth, made at least in part of veal.

In inflammations of no great violence or extent, we may permit some drinks, and even the most nourishing aliments, according to the degree of the disease; but we should be careful always to choose them among the white meats and

vegetables of easy digestion. We must prohibit high seasoned food on account of its stimulating qualities.

In all inflammations, especially those accompanied by fever, we must prohibit the use of wine, except in cases where the disease is owing to a deleterious principle which tends to gangrene.

Exercise is injurious in inflammatory diseases; in general, the patient must enjoy the most perfect repose. It is especially necessary that the part affected should remain without motion, and in a position that favours the venous circulation, and that of the lymph. Thus, when the inflammation is on the leg, we must place it in a horizontal position. The intensity of the disease augments in place of diminishing, if the patient go about or keep his leg in a vertical position.

In regard to sleep and watching, we may, in external inflammations, when they are accompanied with watchfulness and agitation, have recourse to narcotics to moderate these symptoms. But when the inflammation is seated internally, we must be very reserved in the use of these medicines, which mask the progress of the disease, and lead to gangrene: and, in general, when the inflammation is very intense, even though situated externally, we must be guided by the same cautions.

In all cases of inflammation we ought to keep the bowels open by enemata—the secretion of the kidneys should be promoted by diuretic drinks, and that of the skin by diaphoretics.

It is also important to abstract the patient from every thing which can excite lively emotions of the mind. An access of anger would very probably aggravate the disease. But in inflammations arising from a deleterious principle, joy, and other lively emotions, may have a certain degree of utility, by stimulating the system.

The internal remedies best adapted to inflammations are those which are called antiphlogistic; and among these diluents and refrigerants claim the first place.

It is necessary, in the choice of them, to have recourse to the constitution of the patient; to his habits, and especially to the season. In the summer, we should recommend cool and acid drinks, such as lemonade, either vegetable or mineral; currant syrup or vinegar, in any tisane. The patient has in warm weather a decided predilection for these sorts of drinks; but in winter, they might irritate the pulmonary organ, which at this season of the year is more apt to be affected, and lead to catarrhal affections. We ought then to

prefer drinks slightly mucilaginous, such as the solution of gum arabic, a weak decoction of the marsh-mallow root, lint-seed, whey, veal water, chicken water, &c. and we must be careful to give them all warm. It is necessary in every season to introduce into the blood of persons affected with inflammation, a large quantity of liquids, to remedy the loss of the serous part which this fluid undergoes in these diseases. However, we must pay attention to the effect these drinks have on the stomach, and moderate the use of them when this organ cannot retain a great quantity. Is it proper in inflammations to produce evacuations, either by vomits or purgatives? In general, when the disease does not arise from the state of the *primæ viæ*, vomits may be hurtful in producing a metastasis. But there are certain inflammations which depend entirely on the subura of the *primæ viæ*, characterized by a yellow coat of the tongue, bitterness of the mouth, head-ach, nausea, an inclination to vomit. In this case an emetic empties the stomach and the duodenum of matter, which is probably the cause of the disease, and it is often dissipated. We see, for example, many cases of erysipelas and slight inflammations of the throat yield to a vomit. The physician must judge of these differences.

As to purgatives, we must use them moderately. There are no antiphlogistic purges, as has been pretended; all of them irritate more or less, and are improper when inflammation depends upon any cause existing in the intestinal canal. It is right to abstain from them in the commencement of the disease, and to confine ourselves to emollient injections.

We comprehend in the class of external remedies, bleeding, as well general as local, and topical applications. General bleeding cannot indeed be considered as an external remedy. But we speak of it that we may not separate the considerations which it presents from those of local bleeding.

General bleeding may become injurious when the person affected with inflammation is weak and debilitated. It is dangerous when inflammation is produced by a malignant deleterious cause, which has weakened the energy of the vital principle. But in all other inflammations, bleeding produces excellent effects; it occasions throughout the system a relaxation which arrests the progress of the disease, and favours the cure. The advantages derived from it are greater when the inflammation is recent. The number of bleedings, and the quantity of blood to be drawn at each time, must be regulated by the intensity of the inflammation, the age, temperament, and strength of the patient. It

is observed, however, that a few copious bleedings, in which a large orifice is made in the vein, have a better effect than small bleedings frequently repeated. But the only rule relative to the quantity of blood which we ought to draw in a violent acute inflammation, is to bleed until there is an evident alleviation of the symptoms. This is generally effected by a bleeding of twelve or fifteen ounces. But if there be reason to fear the patient will be too much weakened, we are to draw less. A bleeding purely evacuant, in which we diminish the mass of the blood, is most useful; it appears that in evacuating a certain quantity of the blood, we augment the fluidity of that which remains in the vessels by the abstraction of a certain quantity of fibrin; so that an evacuant bleeding has the additional advantage of attenuating the blood. It is also probable that bleeding acts equally on the solids in diminishing their energy, and rendering them less irritable, less sensible of the cause which stimulates the inflamed part, and attracts to it the fluids. Daily experience strengthens this observation.

When we bleed in erysipelas, if it happen that the patient falls into syncope during the existence of this state, in which the vital powers are greatly diminished, the redness disappears entirely, and returns gradually as the patient recovers.

Sometimes we derive great advantages from a revulsive bleeding, i. e. from that which is made far from the part affected. There is no doubt, for instance, that by opening the saphena vein we produce a greater relief of the head than by opening the basilic vein, though we cannot explain this phenomenon.

Local bleedings are made by leeches or cupping glasses. These last are very common in Germany, but in France preference is generally given to leeches, as well because their application causes less trouble, as on account of the repugnance of many patients to a cutting instrument.

To derive good effects from leeches, they must be applied in the neighbourhood of the part inflamed. When they are placed upon the part itself, the flow of blood produces a sensible remission of all the symptoms. But this relief is only momentary, and the inflammation soon becomes more intense than ever, on account of the irritation of the leeches. It is therefore more convenient to apply them a short distance from the inflammatory tumour.

These sorts of bleedings are very useful in inflammations which affect parts beneath the skin, without interesting the skin itself. They produce upon the cutaneous organ an irri-

tation and afflux of blood, which singularly abates the violence of inflammation. Thus we apply them with great advantage on the eye-lids in ophthalmia; at the anterior and upper part of the neck in angina; behind the ears in inflammations of the meatus auditorius externus; to the perinæum in affections of the bladder. Leeches are also very advantageous in hæmorrhoids. But here there is an exception to the general rule, for we procure greater relief by applying them to the tumours themselves, than to the neighbouring parts. It is, however, to be remarked, that hæmorrhoids are not merely inflammatory diseases, but also sanguineous tumours, which distend the surrounding cellular tissue, and that the immediate emptying of them puts a stop to the distension, and calms the pain it occasions.

In erysipelas, phlegmon, complicated fractures, attended with very great tension, leeches are less beneficial than general bleeding.

In treating of particular inflammations of different parts of the body, we shall point out, in a precise manner, the cases in which leeches are beneficial, and the small number of those in which scarifications are preferable.

The topical remedies which we ought to use in these inflammations are only applicable to those which are external. When the disease is deeply seated; as for instance, in the breast, in the abdomen, they have but little action. We should be led to believe they had not any, on account of the distance between the place where we apply them and the affected part. Nevertheless, we often apply fomentations or emollient poultices in certain internal inflammations, and experience seems to prove that they are not altogether useless, and that they produce relaxation. Blisters employed in these kinds of complaints, have certainly great efficacy; but it is believed they act only as revulsives, in cases where the disease is moveable from one part to another.

Topical remedies form an essential part of the treatment of external inflammations, and they are selected particularly from the class of repellents, emollients, and anodynes.

Repellents act in constringing the vessels of the inflamed part; thus they prevent the fluids from coming to it in great quantity, and repel those which the irritation attracts. Perhaps they blunt the sensibility of the nerves of the part to which they are applied, and diminish the effect of irritation upon this part. We have a very familiar and striking example of the action of repellents in the pale colour of the lips of those who have just eaten aliment seasoned with vinegar.

Repellents answer very well in the commencement of

moderate inflammation, arising from external causes, in which metastasis is not to be feared, and if well directed they put a stop to the disease. It is thus that by promptly administering these remedies in a sprain, we hinder the afflux of humours to the irritated part, and prevent the inflammation which is on the point of taking place.

If we apply repellents to a part that has just been moderately burnt, and without detachment of the epidermis, we arrest the disease in the same manner.

Repellents ought not to be employed in inflammations from an internal cause, nor the glandular parts, nor in violent inflammations of any part whatever, nor in inflammations of long standing; for in these cases they may lead to dangerous metastasis, or give rise to gangrene, by arresting the organic action, in consequence of the constriction they cause upon the solids. We have seen examples of this last circumstance in whitlow.

When repellents, administered unseasonably, produce neither metastasis nor gangrene, they may contribute to an induration of the inflamed part. Thus induration of a swelled testicle is produced by applying too late a topical repellent: in such cases this remedy repels only the more fluid parts of the swelling.

It is proper then, before we resort to repelling applications, to attend to the cause of the inflammation, to the texture of the organ inflamed, and to the degree and period of the disease.

We may employ repellents under the form of liquids or of cataplasms. In inflammation of the hand, the fore-arm, the foot, or the leg, we prepare a bath of the repelling liquid, and plunging the part in, leave it there for some hours, or we apply to it compresses wet with a liquid of the same kind. The substances of which the baths or fomentations are prepared, are water and vinegar, which forms the oxigerat, or a solution of the acetate of lead in water, to which is added sometimes a little spirits of wine. When the testicle is inflamed, we employ repellents in the form of cataplasms, which are commonly made of oxyde of iron, and a little vinegar. In many inflammations in which repellents are not indicated, emollients are employed. The effect which they produce in relaxing the tissue of the engorged solids, renders them very suitable to moderate the tension and other inflammatory symptoms. They are employed as repellents in the form of fomentation, or that of cataplasm, according to circumstances.

In general, in inflammations which are seated in the cel-

lular tissue even of the skin, fomentations are preferred, because cataplasms would occasion an inconvenient pressure. The fomentations which are made with tepid water, or a mucilaginous decoction, ought to be used warm, and frequently renewed. The heat of them should be preserved, especially in winter, by placing hot bricks, or bottles filled with hot water, near the affected part; for when emollient applications become cool, they act as repellents. For this reason, if we cannot keep up their heat, we should substitute ablutions of the same kind. Oily substances, which are good emollients, may be used, but they are subject to become rancid by the heat of the inflammation, which renders them irritating. On this account emollient decoctions are preferred.

When the inflammation is seated deep in the cellular, as in phlegmon, emollient cataplasms should be preferred. They are composed of different substances. A very good one is made of linseed boiled in a decoction of marsh-mallows. This has the advantage of being very emollient, and of preserving its humidity for a long time. If linseed cannot be procured, we may substitute a poultice made of the leaves of emollient plants, boiled to a jelly in a decoction of marsh-mallows, or in milk; or a poultice may be made of bread and milk, to which is added the yolk of an egg and a little saffron, to render it anodyne. But this last has the inconvenience of becoming hard and dry, in which case it acts as a repellent. When we use it, therefore, it should be changed before it has time to dry. The composition of a poultice is varied according to the nature of the part inflamed; for example, for inflammation of the eye, it is often made of the pulp of roasted apples, either alone, or mixed with linseed, or a little marsh-mallow water. Whatever poultice we use, it is proper to make it thick, because it otherwise soon becomes cold; at the same time it must not be suffered to grow dry. When the poultice is to be applied to a part covered with hair, it must be previously shaved, in order to prevent the trouble and pain which would otherwise result from the poultice sticking to it.

The poultice is to be spread upon linen, and applied directly to the skin. When it is placed between the folds of a piece of linen, it has much less effect, and acts only through medium of its moisture. However, there are some parts to which it ought not to be directly applied; the eye, for example, for taking it off would be painful on account of the eye-lids. In this case, and in all others in which it would be improper to place the poultice directly over the skin, I

cover it with a very thin gauze. A poultice ought to be spread sufficiently thick, so that it may not dry too soon. Having spread it upon the linen, the edges should be turned over it. Without this precaution, the poultice, by becoming thin at the edges, would dry and stick to the skin. In every case of inflammation, the poultice should be changed every twelve hours, and when the heat of the part is very great, it should be changed two or three times in twenty-four hours; and in the interval of changing the poultice, the part should be sprinkled with marsh-mallow water, to keep up the moisture. Finally, the poultice must be applied warm, and in winter the heat must be retained by covering the part.

Anodyne and composing applications are indicated at all times when the pain is so severe as to deprive the patient of his rest. Those most used are decoctions of saffron, the heads of poppies, henbane, night-shade, and solutions of opium. These remedies must be used with caution, especially the last, because they weaken the vitality of the part, and dispose it to gangrene. Sometimes advantage is derived from topical irritants applied to a sound place, in order to draw the inflammation from the part where it is attended with danger. Thus blisters are put behind the ear in inflammation of the *meatus auditorius*, behind the neck in diseases of the eyes, &c.

The curative indications which inflammation present when having gone through its first periods, tends to any termination whatever, vary as much as the terminations of which the disease is susceptible.

When delitescence is to be apprehended we should remove every thing which can promote it. Repellents and cold air must be especially guarded against. If, notwithstanding these precautions, delitescence takes place, the part is to be irritated by a stimulating cataplasm, or by blisters, or caustics, in order to attract the morbid principle; and we should give internally, according to the state of the pulse and the strength of the patient, active medicines, chosen from among the class of tonics, corroborants, alexipharmics, and cordial remedies.

If these means do not draw the inflammation, it is a sign that it is fixed. The treatment of this new inflammation must be grounded on the nature of the affected organ, the strength of the patient, and the violence of the disease.

Resolution being a very desirable termination of inflammation, when it is about to take place, we ought to neglect nothing to promote it, and to avoid every thing with the greatest care which might prevent it. The emollient cata-

plasms, which have been previously employed to mature the inflammation, are usually sufficient to lead to a perfect cure; therefore, when the inflammation subsides, we should abstain from bleeding, and leave nature to herself. The use of diluting drinks, and a suitable diet, ought, nevertheless, to be persisted in.

When the irritation is almost extinct, and the inflamed part ceases to be painful, we may advantageously join discutient applications to the use of emollients. Thus we may boil in wine, or in beer, the flour of the grain used to form the poultice, or we may add to this flour a discutient farina, as that of beans or barley.

If inflammation be seated in an external gland, the soap plaster, or the *emplastrum vigo*, with mercury, mixed with the plaster of hemlock, helps to procure resolution. But the anxiety of the surgeon to satisfy the desire of the patient to be cured quickly, makes him sometimes have recourse too soon to discutients, which renew the inflammation, and retard the cure. They are only to be employed when the inflammation is almost dissipated.

When the inflammation tends to suppuration, and the inflammatory symptoms retain their violence, although the disease may have existed a long time, we must not cease to combat them, by remedies proper to diminish their activity; for the formation of pus is retarded, as well by too much inflammation as too little. The antiphlogistic remedies, and topical emollients, must therefore be continued. These generally suffice to bring on suppuration. A phlegmon is almost always perfectly matured by the use of poultices of linseed.

But when the inflammation arises from an internal source, when it has been preceded by constitutional irritation, announcing the efforts of nature to throw off the offending cause, and suppuration does not come on, we may then employ, even though the inflammation run high, maturing and irritating applications to fix the cause of the disease entirely in the inflamed part, and bring on suppuration, in this case, the only favourable termination. There are certain inflammatory swellings, which may be regarded in this point of view; such are those which are developed in the cellular tissue about the parotid glands, or any other part, in putrid and malignant fevers.

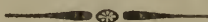
Maturatives are also used in external inflammations, seated deeply, and in which suppuration proceeds slowly, a maturing poultice is made of the flour of linseed boiled in beer, and of sorrel which is cooked with lard or butter

We may add the bulbous roots of lilies roasted under ashes, and a little basilicon, when the inflammation is very violent, as in whitlow. This plan is followed when the patient will not suffer the part to be opened, and often brings on suppuration in twenty-four or thirty-six hours.

But when the swelling does not appear with marked inflammatory symptoms, or when it is seated in a glandular organ, a maturing plaster is particularly proper: that made of diachylon, with gums, is commonly employed. It should be renewed every week. The use of these means, when inflammation tends to suppuration, gradually converts the swelling into an abscess.

We shall point out, in the chapter on gangrene, what is proper to be done when that termination is to be apprehended.

As to induration, it is a termination which we ought always to endeavour to prevent. In inflammation of glandular organs, and those which are not disposed to resolution or metastasis, we ought to proscribe topical astringents and repellents, and employ such remedies as favour the circulation, and prevent the stagnation of fluids, in the part affected.



CHAPTER II.

Of Abscesses in general.

THE term abscess is applied to a collection of matter in any part of the body. We except collections of this kind in the abdomen, which are called purulent effusions; and those in the chest, which take the name of *empyema*, when they exist in either of the thoracic cavities, and that of *vomica*, when they are in the lungs.

Abscesses are always the consequences of inflammation; but sometimes they form in that part which has been inflamed; sometimes in a part more or less remote from it. The former are called *idiopathic*, the latter *symptomatic*, or *abscesses by congestion*. These two kinds of abscesses differ much from one another, in regard to their formation, termination, and treatment. For this reason they ought to be considered under distinct heads.

ARTICLE I.

Of Idiopathic Abscesses.

Idiopathic abscesses often succeed acute inflammations, characterized by well-marked symptoms, and show themselves in a very short space of time. They are then known by the name of phlegmonous or inflammatory abscesses. But sometimes they result from a slow inflammation, the symptoms of which are not apparent, at least in the beginning of the disease. In these cases, they form very gradually, and are called cold abscesses. This distinction is of very great importance.

SECTION I. *Of Phlegmonous, or Inflammatory Abscesses.*

Phlegmonous abscesses have been also called hot abscesses, or abscesses by fluxion. When they are not preceded by any disease, other than acute inflammation, of which they are the immediate result, they may be considered as essential diseases. But when the inflammation which has produced them supervenes in the course of another disease, they may be *accidental*, as when they affect no change in the course of the principal disease; such are the abscesses which sometimes appear on the margin of the anus in pthisis pulmonalis. But if they decide the essential disease, they are then termed *critical* abscesses. Thus we see sometimes a malignant or putrid fever terminate in inflammation and suppuration of the cellular tissue, which surrounds the parotid gland.

Phlegmonous abscess, whether essential or accidental, presents always the same phenomena in its formation.

When inflammation attacks a part plentifully supplied with cellular tissue, when it is acute and rapid in its progress, and when the pain is pulsating, we may infer that in spite of the assistance of art, the disease will terminate by suppuration.

If the pain continue to be pulsating, if the violence of the inflammation diminish somewhat, if the tumour become inelastic, we infer that the formation of pus is going on. Finally, it is certain that pus is formed, if the heat and redness become much diminished; if the pain be connected with a sense of weight, the tumour softened, its centre elevated to a point; and if, in pressing alternately in different parts, we perceive an undulation or fluctuation of fluid in the tumour.

When an abscess is seated under the skin, the fluctuation is always easily distinguished; but when it is situated under thick muscles, or very strong aponeuroses, it is much more obscure, and can be felt only by an experienced hand. In this case, the diagnosis is drawn from a variety of other circumstances, such as irregular chills, the remission of the inflammatory symptoms, a sense of weight succeeding the pulsating pains, to which may be added the flattening of the part. In the case of an abscess deeply seated, if left to itself, it might, notwithstanding the natural tendency to advance outward, remain a long time in the same state, i. e. without presenting more certain marks of its existence. But when the abscess is seated under the skin, the pus distends more and more this membrane, thins it in the centre of the tumour, and opens outwardly after a longer or shorter time, according to the intensity, and more or less rapid progress of the inflammation.

In the commencement of suppuration, the pus is contained in the cellules of the cellular tissue of the inflamed part. It has much consistence, and adheres so firmly to the folds of this tissue, that it must be scraped with a knife, in order to be separated. We observe this fact in the bodies of persons who die of abscess, before the matter is collected into a sac. But in proportion to the augmentation of the quantity of pus in the progress of inflammation, it acquires more fluidity, it distends the cellules which contain it, passes from one to another, either by rupturing them, or by their natural communications with each other, and finally collects in the centre of the swelling, into an abscess formed by the separation of the surrounding parts. Thus on one side it raises the skin; on the other it compresses the muscles, or it separates the fasciæ of the muscles, or finally it raises and flattens the muscles, according as it is situated under the skin, under the muscular organs, or in their interstices. The cavity which the purulent matter forms, is not, therefore, owing to a loss of substance, but to a separation and distention of parts. This is proved on opening an abscess; for we see the parts previously separated and distended approach each other. The purulent cavity, very large at first, diminishes considerably, and disappears in a little time. When having employed unsuccessfully all the means of procuring resolution, we perceive a tumour going on to suppuration; it then becomes proper to favour this termination, and to bring about at once the collection of the matter in one cavity. With this view, if the inflammation be internal, we must continue to apply to it the emollient and relaxing remedies,

which have been previously employed; but if the tumour, pain, and inflammatory heat be less, which indicates in some measure a languid state of the disease, we must make use of maturing poultices or plasters, as we have stated in the treatment of inflammation in general.

Those applications, which are more or less irritating, determine that degree of action which is necessary to the promotion of pus, and its collection into one depot. When the tumour is considerable, poultices are preferred; otherwise it is to be covered with a litharge plaster.

When by the use of these means the abscess is mature, that is to say, when the collection of pus is formed, and the fluctuation makes it plainly perceptible, it is essential to examine, if it be proper to open the tumour by art or to leave it to nature.

When a phlegmonous abscess is seated immediately under the skin, and when it is not large, and the progress of the inflammation which produced it has been rapid, we should leave the opening of it to nature; especially if the disease be on the face, neck, or the breast in women, because we thus avoid the deformity which would result from the cicatrices made in these parts. The success which constantly attends this practice, has led many physicians to extend it to subcutaneous phlegmonous abscesses of other parts, even when the collections of matter are very considerable. But the precept which they give, to leave to nature all subcutaneous abscesses, is too general. We should adopt or reject it, according to the situation of the abscess, its extent, and the part of its surface where the skin will ulcerate.

There are even some subcutaneous abscesses which by their diminutive size appear proper to be left to themselves; and which certain circumstances, lead us to open with a cutting instrument. For example, when the progress of the disease is slow, when the tumour is equally soft in every part, and the skin of a reddish and brown colour, if we leave to nature the opening of the abscess, the skin would become extremely thin by the loss of the cellular tunic which forms the interior lamina of this membrane, and thus deprived of a part of the vessels which nourish it, would become incapable of re-uniting with the subjacent parts, rendered soft and fungous by the long presence of the purulent matter. We should then be obliged to remove all the thinned skin of the disorganized part. Another case, in which an abscess, though small, ought to be opened very early, is when the inflammation occupies a part where denudation of a tendon, and its consequent exfoliation is to be apprehended; as we observe

in the fingers in the inflammatory affection called whitlow.

When we judge that the opening of an abscess ought to be left to nature, we should promote it by emollient and relaxing applications; such as we have recommended to combat the inflammation; and when the tumour is opened, or it is broken, we are to continue these remedies until the disease is perfectly cured.

When the extent or situation of a phlegmonous abscess renders it necessary to open it, we should wait until the pus is well formed, or, as it is commonly expressed, until it is ripe. This condition is particularly required in phlegmonous inflammations of the glands, where the tumour ought not to be opened until it is softened in all its parts. This is one of the cases, in which art, prematurely exercised, interferes with the course of nature; for by opening these sorts of tumours too soon, we arrest the progress of the suppuration, which ought to melt down all the hard parts about the abscess, and thence results a callous ulcer very difficult of cure. Add to this, where we open an abscess before its perfect maturity, the pain is much more acute.

This rule, however, admits of some exceptions; and we ought to open an abscess of a gland before the suppuration is complete, when there would be danger in waiting too long, as in the following cases.

1st. Where the abscess is near an organ surrounded by a great quantity of cellular tissue, as the lower extremity of the rectum. If we waited to open such an abscess for the total solution of the inflamed parts, the intestine would become denuded to a great extent, and its union with the adjoining parts would be difficult.

2d. When there is reason to fear that suppuration would injure a tendon, by depriving it of its cellular tumour.

3d. When the abscess may cause some serious accident, as those do the parotids sometimes in malignant fever, preventing the free return of blood from the head to the heart,—a considerable phlegmon on the anterior part of the neck, preventing respiration and deglutition.

4th. When there is danger of the abscess communicating with a joint, or some cavity, as the abdomen, &c. We think, however, that this fear is not so well founded as has been imagined, since in the inflammation of the cellular tissue, which unites the parities of great cavities to the serous membrane which covers them, it has been observed, that this membrane becomes thick, and forms an impenetrable barrier to the pus, which finds a readier way to their passing along

the interstices of the muscles, than to penetrate into this cavity, by piercing the thickened serous membrane; nevertheless, as the membrane might itself be comprised in the inflammatory swelling, and receive some injury in its texture by the progress of suppuration; and since, moreover, examples are related of the death of persons from a purulent collection in the chest, in consequence of an abscess on its parietes, or in the arm-pit, it is most prudent to hold to the established rule, and open such abscesses early.

In the class of phlegmonous abscesses, which ought to be opened early, some have reckoned those which are situated over the bones, and those which surround large arteries. In the first case, it has been feared that the pus would affect the bones; and, in the second, that it would weaken the coats of the arteries, and expose them to yield to the impetus of the blood, dilate and form an aneurism. But these fears are unfounded. When the cellular tunic surrounding the bones inflames and suppurates, the periosteum becomes thick and guards the bone from the contact of pus. Moreover, pus has no irritating, much less corroding qualities, when it follows a phlegmonous inflammation, and has not been exposed to the contact of the air. When on opening an abscess situated over a bone, we find it carious or necrosed, it is the osseous structure itself which has been primitively affected, and the abscess in this case has been the effect, not the cause of the alteration of the bone. In respect to the arteries, it is observed, that when the cellular tunic which surrounds them has been absorbed, the coats thicken rather than become thin, and afterwards produce granulations, which quickly unite to the neighbouring parts.

Large phlegmonous abscesses, deeply seated under thick muscles, or under a large and strong aponeurosis, merit particular attention. They do not form, like subcutaneous abscesses, a prominent tumour; the resistance that the muscles and aponeurosis oppose to pus, hindering it from approaching the skin, it runs into sinuses, forms passages, extends very far into the cellular tissue, which fills the interstices of the vessels, and unites them to the bones. In these sorts of abscess, where the fluctuation is almost always obscure, as soon as we have acquired, by rational signs, sufficient indications of the existence of pus, it is necessary to make an opening for its discharge, as it would be dangerous to temporize, in the hope that the fluctuation would be more sensible. I might here relate a great number of cases, which prove how much we endanger the safety of patients, by deferring too long the opening of these large

abscesses, situated under thick muscles; but I shall confine myself to the following fact.

Madame D——e, after an accouchement, was seized with a putrid fever. Towards the close of the disease, the lower and anterior part of the right thigh swelled, and became very painful, but without sensible augmentation of heat, and without change of the natural colour of the skin. Poultices were applied to the part for more than a month. Being called in consultation at the end of this time, I learnt that the pain, after having been very acute and pulsating, had insensibly diminished, and was changed into a sense of tension and weight,—that the patient had suffered irregular chills, and that the tumefactions had gradually augmented. Placing the hands on the anterior and lateral parts of the thigh, and pressing alternately with one and the other, I perceived an evident and deep fluctuation. I pronounced that there was a large abscess under the triceps femoris muscles, and proposed opening immediately. My proposition was not adopted, and poultices were continued for eight or ten days. The patient having at length consented, I made two incisions, one from without, the other from within. The bistouri penetrated across the triceps femoris muscle into a cavity whence there flowed an enormous quantity of pus. This muscle was separated from the tumour to a great extent; the pus had passed into the hollow of the ham, and along the posterior part of the leg before the glutæi muscles; and notwithstanding two counter-openings which I made behind, one in the ham, the other in the posterior part of the leg, it was impossible to hinder the matter from insinuating itself into deep sinuses, where it stagnated. Slow fever and colliquative sweats supervened, and the patient died one month after the opening of the abscess. This enormous abscess, although very near the articulation of the knee, had not affected it in any manner; but as the muscles, which pass over this articulation and close it, were raised, and as in the bent position in which the leg remained, the crucial and lateral ligaments were relaxed, the tibia had an unnatural lateral motion, which rendered the slightest movement very painful.

There are two methods of opening abscesses. In phlegmonous abscesses, caustics and the knife have the disadvantage of exciting pain upon the skin, whose sensibility is augmented by inflammation. In one case, where the fears of the patient obliged me to have recourse to caustic potash to open a considerable phlegmonous abscess, situated at the anterior and inferior part of the abdomen, the pain

produced by the first impression of the potash was so severe, that the patient begged me to remove it, and to make the necessary incisions.

A cutting instrument then must be used to open abscesses : those in use are the lancet and bistouri. Formerly abscesses were opened with what was called an abscess lancet ; at present the bistouri is generally preferred. However, we may use indifferently one or other of these instruments, when the abscess is superficial, and of little extent ; but when it is deep seated, and there are many parts to be cut before arriving to the matter, the bistouri is altogether preferable.

There are two ways of using the bistouri to open abscesses. In one, this instrument, held so as to cut from within outward, is plunged into the tumour until its point reaches the pus ; and when we see this fluid come out by the sides of the instrument, it is to be elevated more or less obliquely, according to the thickness of parts to be cut, and the incision thus enlarged. In the other manner, the bistouri is held so as to cut from without inward ; the point is plunged into the tumour, and the incision enlarged, by drawing the instrument towards you ; or if the abscess be situated very deeply, some previously cut the skin and other parts which cover the purulent matter. This first opening being made, the finger is to be introduced into it ; and if it be judged requisite, the opening may be enlarged, by passing the finger below one of the angles of the wound, to shield the integuments one way, while we cut the other.

The opening of phlegmonous abscesses ought to be made in the most prominent parts, where the skin is thinnest, and to extend to the most depending part. If the point of the abscess be in the upper part, it is better to open it there, than to cut through a great thickness of parts below, which being inflamed and tender, would give very great pain. This being done, we may afterwards change the situation of the part, or if that be impossible, make a slight compression on the lower part of the tumour, so as to prevent the lodgment of pus. The direction of this opening ought to be parallel to the longest axis of the tumour, and its length must be proportioned to the size and depth of the abscess ; in general it will be found large enough, if it afford a ready exit to the matter. When the abscess is very extensive, and the skin equally thin over the whole surface of the tumour, it is proper to make, at its lower part, an incision large enough to give free issue to the pus. In cases where the form or the size of the cavity does not permit the pus to pass out freely

through a single opening, it is necessary to make others in parts where it may seem most convenient.

In opening a subcutaneous abscess, we never run the risk of wounding large arteries; but when an abscess is deep seated, the soft parts, which cover the purulent collection, and which must be cut, may embrace arteries which might give out a good deal of blood. We should avoid cutting such vessels; and if, notwithstanding our endeavours to avoid them, they are cut, we must use the ligature or compression, as the case may require.

Some practitioners, after having opened a phlegmonous tumour, introduce a finger into the cavity of the abscess, in order to destroy any bands which may exist. Such bands are always more or less numerous, according to the time when the opening has been made. This practice is decidedly contrary to the intention of nature and the rules of art, for these bands are no other than small vessels and nerves, which nature preserves to effect the union of the parts. Moreover, this operation is so painful, that patients who have once suffered it, dread it much more than the incision itself: nevertheless, the introduction of the finger is sometimes necessary, but only with the view we have before pointed out, i. e. to examine the extent of the abscess, and judge if the incision should be enlarged, and a counter-opening made.

When the circumstances which have preceded the formation of an abscess lead to the presumption that it has been occasioned by the presence of a foreign body, it is proper, as soon as an opening is made, to introduce the finger, and to search for the foreign body, and when found, to extract it. But these examinations should be made with great care, to spare the patient the severe pain which they occasion.

Formerly, after opening phlegmonous abscesses, it was thought a matter of great moment to squeeze out, even to the last drop, the pus they contained; but this practice, alike painful and unnecessary, ought to be banished. The introduction of a great quantity of lint into the cavity of an abscess is also very injurious; it opposes the free escape of pus and the contraction of the sides, thus rendering the cure more tedious. Now, when an abscess is opened, the pus is left to flood out of itself; the wound is wiped with a slight compression, and lint laid over it, a small quantity only being put in the lips of the wound, to prevent them from uniting; or if the incision have been made very deep, a strip of linen is employed for the same purpose. The whole is to be covered with an emollient poultice, which is to be con-

tinued until the tumour is dissipated. Cerate may now be used for the dressing. I commonly employ the ointment of styrax, cerate, and oil of hypericum in suitable proportions.

After the first day, the use of digestives is to be left off, because it might too much relax the skin, and the wound is to be covered by dry lint kept on by a proper bandage.

When the abscess is large and deep,—when the opening has not been made large enough, or in the most favourable spot for the discharge of pus, it forms sinuses and fistulæ, in which the pus stagnates, and renders the cure long and difficult. We suspect the existence of these sinusses and fistulæ, when the abscess discharges more pus than its extent warrants. We ascertain it by compressing the tumour so as to discharge the pus from the most remote parts of it. By a sound introduced into the sinusses we know their extent and direction.

The end which is proposed in this case, is to furnish, if possible, to the purulent matter, an issue, by which it may be easily discharged; for the pus which is stagnated becomes more hurtful in an abscess after it is opened, than it was before, because the air corrupts it immediately. The pus so retained prevents the sides of the sinus from drawing together, and by softening the granulations, which are continually moistened, it takes from them the degree of inflammation necessary for their re-union: but art offers different means of fulfilling the indications which these abscesses present, when accompanied with fistulæ or slime. Sometimes it is only necessary to give the part such a situation as allows the pus to run out; at other times, it is necessary to enlarge the opening to such a size as will permit the free issue of matter. In some cases, we are obliged to cut the fistulous sinus throughout the whole length, and quite down to its bottom; but before resolving upon this incision, we should try what is called expulsive compression. This compression is made externally along the course of the sinus with lint and graduated compresses, which ought to be so disposed as to run more on the bottom than on the opening. If we suspect that the flesh is soft and fungous, previous to using compression we are to employ detersive and slightly stimulating injections. The number and situation of the fistulæ sometimes render all these means unavailing. A counter-opening is then often necessary. This may be made in several ways, or we may cut from within outwards the parts over the bottom of the sinus, while we retain the pus in this situation by applying a dossil of lint in

the opening already made; or we may cut the part distended, with a finger introduced to the bottom of the sinus; or we may make an incision on the sound, when the depth of the sinus is too great to be reached by the finger. We give to the counter-opening an extent so large that the pus may be discharged freely of itself; that is to say, by the inclination of the parts that contain it. If this counter-opening be not large enough, it is necessary to insert a seton.

That this counter-opening may have every advantage, it must be made in the spot where the pus is collected, or where the inclination leads it most. When there are several fistulæ where the pus is deposited, there must be as many counter-openings as there are cavernous sinuses, and not be one opening common to all.

When all the expedients of which we have spoken are insufficient or impracticable, we must have recourse to injections to cleanse the cavities where the pus is accumulated. These injections ought to be made with a large proportion of water, with a substance adapted to the state of the granulations. It is necessary to repeat them at least twice a-day, if there be much suppuration. To prevent the matter from corrupting, between one dressing and another, we ought, if the cavity be large, to use a large syringe, which can discharge a good deal, so that the injection may soften and carry away the matter entirely. We must place the part in such a manner that the liquid will flow from the cavity by its own weight, and not by the impulse of the injection alone, which ought to be given without violence.

Finally, in fistulous abscesses and sinuses, canulæ of silver or gum elastic offer a reserve which is not to be neglected. By means of them, we have a constant and free vent to the matter, we prevent its stagnating, and favour the approach and re-action of the sides. More extended details on this subject, belong to a kind of diseases of which we shall speak hereafter. These are fistulæ.

ARTICLE II.

Of Cold Abscesses.

The name of cold abscesses is given to those which result from a purulent collection in a tumour, in which the symptoms characterizing inflammation have not been well marked, especially in the beginning of the disease. These abscesses

are situated in the lymphatic glands, or in the cellular tissue. We shall here speak only of the last.

The external characters of cold abscesses have such a resemblance to those of abscesses by congestion, that they are often confounded with them, as well in practice as in theory. Both are, in fact, the product of an obscure, slow inflammation; but there is an essential, and very remarkable difference between them. In cold abscesses, the matter is collected in the parts, where it is formed, and does not extend beyond the bounds of the tumour. While in abscesses by congestion, the pus resulting from caries in one or more of the vertebræ runs along the cellular tissue, and collects far from its origin, forming tumours sometimes of very great size.

Cold abscesses always depend upon an internal cause, and when they have been preceded by contusion or pressure, we are to regard this as an occasional exciting cause. They generally arise from the serofulous disposition. The rheumatic diathesis may produce, in the cellular tissue, lymphatic collections, which terminate in cold abscesses. These abscesses may form in all parts of the body; but most commonly they are found in those where the cellular membrane is most abundant. We see them rarely on the head, often on the neck, the breast, back, loins, and extremities; as well upper as lower. Their seat is commonly under the skin. They form, however, in the cellular tissue which unites the serous membranes of the chest and abdomen to the sides of these cavities, in the interstices of the muscles, and especially of those which occupy the posterior part of the thighs, where I have met with them very often.

Cold abscesses commence by a tumour of greater or less size, hard, with large base, circumscribed, immoveable, without heat, pain, or change in the colour of the skin. The patient experiences no pain before the developement of the tumour, either in the place which it occupies, or in remote part. This last circumstance distinguishes essentially cold abscesses from abscesses by congestion. The tumour extends, gradually becomes soft, and elevated; but fluctuation is not manifest until after having been for some time obscure and profound. In proportion as the tumour enlarges, the patient experiences in it a dull pain, which pressure increases. Hitherto the inflammatory symptoms have not been striking; but a certain degree of heat is soon felt. The skin assumes a pale red colour, and becomes thin. The tumour increases, the red-

ness becomes more bright, the pain and heat augment, the skin becomes white; at last it opens, and gives vent to purulent matter. The opening is at first very small, but soon becomes large; the edges become thin, and it degenerates into a fistula very difficult to treat, often incurable.

As the qualities of pus are in general good in proportion to the acuteness of the inflammation, that which forms in these sort of abscesses, very different from that of phlegmonous abscesses, is of bad quality, not consistent, serous, and of a yellowish-green colour, like whey which contains some flocculi of caseous matter. It becomes fœtid as soon as it is exposed to the air. The sides of the cavity not inflaming, do not offer the conditions favourable to their re-union, as in phlegmonous abscesses: they are more or less thick, consistent, and form a kind of cyst, resulting from the slow accumulation of pus, which gradually presses the folds of cellular tissue against each other.

We should attempt, in vain, in most cases, to resolve tumours which give birth to cold abscesses. It might, perhaps, be inconvenient or improper to discuss them, because we should have to fear that the morbid matter which occasioned them would affect an interior organ, perhaps one essential to life. These sorts of tumours ought to be considered as critical, since they are efforts of nature to throw upon external parts a morbid principle, which would otherwise have affected an internal organ: hence all the assistance of art ought to tend, on the one hand, to correct the general morbid disposition which gave birth to the disease, and, on the other, to accelerate the formation of pus in the tumour. The first indication is fulfilled, by prescribing to the patient such a regimen and internal medicines as are suited to the disease which has produced the local affection. The second indication is answered by applying to the tumour topical maturatives. It is commonly covered with the plaster of diacholon cum gummis, which is changed every eight or ten days.

When the tumour is soft, and the fluctuation is very distinct, we ought to give vent to the pus, by a suitable opening; but this opening ought only to be made when the tumour is soft in its whole extent, and the interior of it entirely dissolved by suppuration. If we made the opening before this time, it would be very injurious, and the matter might degenerate into a fistula, of which the cure would be difficult. On the other hand, if we deferred too long making the opening, or left it to be made by nature, the skin would become exceedingly thin before the opening took place, its

organization would be destroyed, and the re-union would be very difficult, perhaps even impossible.

The situation of cold abscesses sometimes renders it necessary to open them before they are perfectly mature, lest they should extend to places, the disposition of which would oppose itself to a re-union of their sides: thus, for example, I have several times determined to make an early opening into abscesses, seated in the inferior lateral part of the neck, to hinder them from extending behind and below the clavicle; the situation of which, in regard to the breast, would not permit the sides of an abscess to approach and re-unite.

Caustic potash is generally preferred to the knife to open cold abscesses, with a view to excite the vital properties of the sides of the tumour to determine suppuration more speedily, to give to the opening a sufficient extent for the free exit of pus, and to hinder the wound from closing before re-union has taken place. The mode of using caustic potash is simple. The middle of the lower part of the tumour is covered with a plaster of diachylon cum gummis, in which is an oblong opening of an extent proportioned to the quantity of potash which we wish to employ. On that part of the tumour which the hole in the plaster has left bare is to be put one or more pieces of potash, which are to be kept there by a little lint; a second plaster, larger than the first, covers the whole, and the apparatus is retained by a compress and a bandage somewhat light. Most practitioners remove the caustic at the end of three or four hours; because, in that time, the skin is destroyed throughout its whole thickness. But when a quantity of potash is employed, proportioned to the extent of the eschar we wish to form, no injury results from leaving it on a much longer time. I seldom remove it before the expiration of twenty-four hours. It must always be recollected, that caustic potash extends its action much beyond the place on which it is applied, and that the eschar which it produces is commonly five or six times as large as the piece of potash which has been employed.

On removing the dressings, if pus do not escape, a bistouri is to be plunged perpendicularly across the eschar, into the cavity of the abscess; and when we see pus coming out by the sides of the instrument, we are to enlarge the opening as we withdraw it. This opening ought to have such an extent only as will allow the pus to be gradually evacuated. Were it too large, the free access of the air would occasion high fever. Some practitioners, in order to prevent this, leave the pus to be discharged of itself. In this case the

tumour discharges little by little, the sides approach as it is emptied, and the air can have no access. This method, although very good in itself, can only be proper when the skin which covers the part of the tumour where the potash is applied is very thin; for when the skin preserves its natural thickness, the action of the potash does not extend through the whole thickness of the sides of the tumour; and thus, when the eschar is detached, it is not opened. It would then be necessary to cut the parts covered with granulations, and rendered very sensible by inflammation; which would cause much pain.

After the opening of an abscess, the dressings should be simple. The eschar is to be covered with a litharge plaster, retained by compresses and bandages, and renewed more or less often according to the abundance of the suppuration. The eschar is detached at the end of ten or twelve days, as pus flows out in greater or less quantity. The cavity of the abscess empties itself, and its capacity is diminished, the sides re-unite, and the wound closes. When the re-union of parts takes place too slowly, we have recourse to stimulating detergent injections, and to expulsive compression, if the situation of the part permit.

If a cold abscess be very large, if its situation near a bone lead us to fear that it may be involved in the disease, the greatest precaution must be used to prevent air from getting into the cavity, and affecting its internal surface. Now the caustic potash is not always free from this inconvenience, because the opening it makes is always too large for us to regulate at pleasure the discharge of pus; so that the abscess discharging itself suddenly, its large sides cannot contract quick enough to prevent the access of air, and the accidents which result from it.

To avoid this inconvenience, abscesses have been opened by a seton. This method, which has been greatly cried up by many authors, who have proposed it indiscriminately for all kinds of abscesses, appears to me less advantageous than the following.

It consists in evacuating the abscess by means of puncture. For this purpose the bistouri is to be plunged into the lower part of the tumour. When we have discharged through this opening as much pus as we judge proper, its sides are to be brought together, and united by means of sticking plaster. Five, six, or eight days afterwards, and always before the tumour has resumed its former size, a second puncture is to be made in the same manner: so the punctures are to be repeated, until the sides of the abscess become

united. Sometimes the edges of the opening inflame and separate, and the orifice remain fistulous. But this is readily cured, if the abscess be simple and unconnected with caries of an adjacent bone. I have sometimes used a cornea knife to make this puncture; but I have remarked, that the opening made with this instrument is generally too small, and that it becomes stopped by the flocculi of albumen, which float in the pus. The number of punctures which are necessary is indeterminate, and varies according to the size of the abscess, and the quantity of pus which is evacuated each time. I have made six in a very large abscess, which terminated well. The advantages of this method are evident. By means of it, we regulate the flow of pus at pleasure; we give time to the sides of the abscess to contract, and thus prevent the access of air; the impression of which, as we have said, is always injurious. This method is particularly proper when we have any doubts as to the character of a cold abscess, which may be readily mistaken for an abscess by congestion. In doubtful cases, it has the double advantage of curing the disease, if that be possible, and of retarding the approach of death, if that must ensue.

I might borrow from different authors a great number of cases, which prove the good effects of the practice which I have just described. I might also relate several of my own; but I confine myself to the two following, which appear to me very remarkable.

CASE I. M. Baret, aged eighteen, of a robust constitution, came to Paris in the year 1798, to study medicine. In December of the year 1799, he felt wandering pains in the different articulations, particularly those of the thigh and knee. They were not very intense at first, but in the month of April they were so severe as to hinder the patient from walking; his digestion was impaired, and the loss of appetite almost entire. He took an emetic, and some time afterward a purgative, which produced excellent effects. The pains disappeared, but returned two months afterwards. They affected alternately the back, the loins, and the buttocks. Intent upon his studies, young Baret left his case to nature. The pains continued, with variations in their violence, until the month of January of the year 1800, at which time they had greatly diminished, and settled in the right groin. They were felt only when the patient rose, after having sat a long time, and were transient. On the 14th of February, following, he felt, in putting his hand into his pocket, a tumour as large as a pigeon's egg, which he took for a

hernia ; but reflecting that he had not sprained himself, and that he had felt some pains in his back and loins, he abandoned this first idea ; and the tumour evincing, on the other hand, manifest fluctuation, he was assured of the existence of an abscess by congestion, arising from the caries of vertebræ. M. Baret was not ignorant that this disease is beyond the resources of art ; that it is constantly and quickly fatal. Seeing the disease advancing, he consulted several persons, and finally entered the Charité. The day after his entrance, he was constantly vomiting, without a moment's respite ; an emetic was given, which produced the desired effect. He took small quantities of food, and drank a decoction of bitter plants. He drank also rice-water, because he had diarrhœa. Some pains were felt in the loins, and the tumour grew somewhat larger.

The 5th of May, the thirtieth day after his entrance into the hospital, the tumour was as large as a guinea hen's egg, and very indolent ; it disappeared upon pressure, and the liquids it contained seemed to be lost among the muscles, which form the anterior and lateral sides of the abdomen. I resolved to open it ; but as its character was equivocal, I thought it proper to take every precaution to prevent the entrance of air into the cavity of the abscess. M. Baret being laid upon his back, I plunged a cornea knife into the centre of the tumour. As soon as the instrument was withdrawn, I applied a cupping-glass, which was removed at the expiration of a minute, and another put in its place. The third produced no effect. By this means I obtained about four ounces of inodorous pus, about the consistence of whey, thick and turbid. I covered the opening with a plaster of diacholon cum gummis, which was retained by a compress and bandage. After the operation, the patient, in getting to his seat, perceived a small quantity of liquid flow from the opening. Towards evening he had chills ; pains and slight heat were felt in the parietes of the abdomen, the opening of which had closed the day after. The heat and pain increased until the fourth day after the puncture, when they began to diminish. These symptoms of slight inflammation confined to the anterior part of the abscess, were opposed by diet, diluting drink, and the application of emollient poultices. They had entirely disappeared on the eleventh day. The following days offered nothing remarkable ; the diarrhœa appeared and disappeared several times ; the patient was without fever, and digested well ; the sides of the abscess had become very thick ; the purulent collection had even increased, so that I resolved to make another opening fifty-

seven days after the first. I followed the same process, except that the instrument which I employed was narrower. The quantity of pus obtained was inconsiderable. This second puncture was followed neither by pain nor inflammation. The tumour retained nearly its former size, which led me to believe that the second opening had not been large enough to discharge the pus. I made a third, eighteen days after the second, which proved to me that the size of the tumour was owing rather to the thickness of its sides than to the pus which it contained. The matter discharged had become thick and viscous. After the third puncture, the tumour diminished daily; a ridge, which extended from right to left, divided it into two parts, harder than natural, and indicating the re-union of the sides; the patient was well. The first month which followed the third puncture new pains were felt in the loins, and a return of the disease was dreaded; but a blister applied to the left side of the vertebræ relieved them, and M. Baret left the hospital the 14th of February, of the year 1801, perfectly cured. Two years after this he returned to the hospital with ascites, and died. The opening of his body showed no other traces of the abscess, than a white long line in the cellular tissue of the lower part of the iliac region. This line corresponded to the situation of the abscess, the sides of which, formed of cellular tissue, contracted and condensed, had become again converted into cellular tissue when the pressure which formed them had ceased.

CASE II. Miss —, aged nineteen years, of a good constitution, born of healthy parents, and very healthy herself, felt toward the end of the year 1803, a rheumatic pain in the left thigh. She attributed this to a cold which she had taken after being heated by dancing in the open air. After having continued for several months, the pain left her, and returned in the course of the winter. But now it was fixed in the left lumbar region, where it remained until the spring of the year 1804. At this time, in the same lumbar region, a tumour appeared, which insensibly increased until the month of September, of the year 1805, when I was consulted. The tumour was then at least five inches in diameter; it was indolent, without heat or change in the colour of the skin, and with a sensible fluctuation. Its situation, and the pains which had preceded it, made me apprehend a caries of the vertebræ of the loins. I prognosticated ill, and expressed to the parent, my desire to be assisted by the advice of one of my brethren. One of the most distinguished practitioners of Paris was called in consultation. His

opinion, as to the nature and danger of the disease, were entirely similar to my own; but we differed as to the treatment. He wished to open the tumour with potash, after waiting until the skin had become extremely thin. I thought it best to open the tumour immediately, and with a narrow bistouri. Satisfied with the reasons upon which I grounded my opinion, and which I shall detail in treating of abscesses by congestion, he conformed to my advice, and I proceeded to the operation, in his presence, in the following manner. The patient being placed on the right side, I plunged a very narrow bistouri, obliquely from below, upwards, into a part just below the middle of the tumour, and drew it out as soon as I saw pus discharged by its sides. The matter was serous, and of a yellowish colour. When I had discharged about six ounces, I stopped it, by drawing the skin transversely, so as to bring together the two lips of the small incision, upon which was applied a plaster of diacholon cum gummis. Eight days afterwards I made a second puncture, which gave vent to a quantity of pus, almost equal to that which was discharged by the first operation. In the course of six weeks, three other punctures were successively made; but at each time the quantity of pus which was discharged became less, and I was obliged to plunge the bistouri more deeply, in order to reach the cavity of the abscess. The last puncture opened at the end of five days, and formed a fistula, which was not entirely healed before the end of a month. After the third puncture, in touching the left anterior part of the abdomen, I perceived an indolent tumour, of no great size, which I believed to be formed by the approach of the sides of the abscess. This tumour has gradually disappeared; Miss ——— is entirely cured, and has since enjoyed very good health. In the treatment of cold abscesses, the aid of art is not always confined to the opening of the tumour, and the external means, which are suited to the causes of the disease. A drain is often necessary, to hinder the cause, which has given rise to the abscess (and which it is not always possible to destroy) from affecting some important organ, and producing fatal symptoms.

ARTICLE III.

Of Abscesses by Congestion.

The term abscesses by congestion has been given by authors to purulent tumours of very different kinds. Thus it has been used to designate abscesses resulting from slow inflammation, and affecting the part where they form, and those whose primary source is far from the place where the collection appears; even certain tumours which do not contain pus, such as wens, have been thus denominated.

To avoid all doubts, in words, as well as in things, we confine the term abscesses by congestion to those, the pus of which is produced by caries of the vertebræ, or a large joint, as that of the femur with the acetabulum, and, running along the cellular tissue collects and forms an abscess, in a part more or less remote from that where it was generated. We shall here only speak of abscesses which depend upon caries of the vertebræ. We shall treat of those which accompany caries of the large joints, in speaking of diseases of the bones.

Abscesses by congestion constantly arise from caries of one or more of the vertebræ, of the back or loins, rarely of the neck. This caries itself often depends upon an internal morbid cause, serofulous, rheumatic, or some other which attacks the vertebral column, and produces a swelling, and finally ulceration of the ligaments, spongy tissue, and bodies of the vertebræ. But caries of the vertebræ, and abscesses by congestion, are often occasioned, especially in boys, by a habit of excessive masturbation.

However, all carious affections of the vertebræ are not followed by an abscess. The dissection of a great number of bodies of persons who have died of this disease, has led me to remark, that where the caries is superficial, it is followed by an abscess by congestion, and that where it is deep seated, it converts the vertebræ into a kind of putrid mass, causing a curvature of the back, which constitutes the affection we call the *Vertebral Disease of Pott*; of which we shall speak hereafter.

Whatever be the causes of abscess by congestion, the patient experiences, long before the formation of pus in the vicinity of the carious bone, a dull, obscure, but continued pain, which is usually regarded as rheumatic. This pain is not often followed by any alteration in the health of the

patient. Sometimes, however, his countenance is pale and sallow; but the functions continue to be performed in a natural manner. As the pus forms, the pain diminishes, and after a length of time it appears at a distance from the place of its origin. It sometimes appears in the back, in the perinæum, near the anus, but most frequently in the groin. The cellular tissue, which extends from this part to the vertebral column, being loose and abundant, offers a feebler resistance to its passage. The pus, at the same time, being pushed down by the diaphragm and abdominal muscles, runs along the psoæ muscles and iliac vessels, and collects in a body at the anterior superior part of the thigh, behind the *fascia lata*.

The tumour forms and increases very slowly, when suddenly it assumes a large size. It is indolent, without change in the colour or heat of the skin. It is soft or hard, as it is commonly under the skin, or under a thick aponeurosis; softer when the patient is in a horizontal than in an erect position. It fluctuates throughout its whole extent more or less distinctly, according as it is situated more or less superficially. When compressed, it yields, and appears in another place.

Abscesses by congestion ought not to be confounded with abscesses from any other cause, which, situated deep under thick muscles, or aponeuroses, have not been opened in season, and have extended far in directions where they have met with least resistance. We shall easily avoid this mistake, if we consider the situation of the abscess, the circumstances which have preceded it, and the manner in which it has formed. Thus we may distinguish an abscess by congestion from a cold abscess, if, in the latter, we find the patient has felt no pain before the development of the tumour, and that the pain he has felt in the progress of the disease, has always been in the part where the collection is formed; while, in the former case, he will always be found to have felt, long before the appearance of the tumour, a dull pain in some point of the vertebral column, more or less remote from the seat of the tumour, but none in the tumour itself.

Very rarely does the seat of the tumour deceive an experienced practitioner, as to the true nature of the disease; nevertheless, when the tumour appears in a part not far from that where the pus has formed, the diagnosis is more difficult: but the moment we find pain has preceded the formation of an abscess, we may conclude it is an abscess by congestion.

Here are two cases, one of cold abscess, the other of abscess by congestion, in which the pain led me to discover the true nature of the disease.

CASE I. A man had, at the superior part of the back, toward the right shoulder, a large tumour, without change in the colour of the skin, and in which no fluctuation was evident. The patient had felt no pain before the appearance of the tumour, or at its commencement; only a short time since the tumour itself became somewhat painful. Some persons were fearful of caries of the dorsal and cervical vertebræ, but the absence of pain before the formation of the tumour led me to pronounce it a cold abscess, which ought to be opened in the lower part with caustic potash. I applied the caustic, and next day divided the eschar. A large quantity of serous pus came out, which gradually dried, and the patient recovered entirely, proving, as I had said, that he had only a cold abscess.

CASE II. A patient who came from Bicetre to the Charité, had an abscess near the inferior angle of the right scapula: It had formed gradually, without pain, heat, or change in the colour of the skin. I learned, that long before the developement of the tumour, the patient had experienced, at the upper part of the back, a dull pain, which he had attributed to cold. This led me to believe it an abscess by congestion. I opened it: the orifice remained fistulous; the pus, which was serous, became fetid; fever supervened; the vital powers sunk, and the patient died at the end of ten months. On opening the body, I found a fistulous sinus, which penetrated into the chest, passing below the sixth rib, and running between the pleura and ribs, up to the third dorsal vertebra, the body of which was carious.

It would be useless to relate other cases, to prove that pain in the back or loins, which precedes the formation of abscesses by congestion, is a sign almost characteristic of the disease. We shall not confound pain in the back with lumbago, if we reflect that this last is not constant, and that it is seated in the muscles of the back, of course less deeply than the pain of which we have spoken: finally, it is not increased by pressure made by the fingers, which is intolerable in lumbago.

When once formed, abscesses by congestion successively increase in size; the pus continuing to flow from the parts where it originates. The tumour, as it grows larger, thins the skin; and if it be situated under an aponeurosis, it raises it up, and separates its fibres: it rises to a point,

and opens spontaneously ; or perhaps art prevents the work of nature. In either case, more pus is discharged than we should have expected the tumour to contain, because it comes from afar, and is furnished from sinuses which supply the principal tumour. It is ill-digested, not consistent, of a greyish-yellow colour, inodorous, and containing albuminous particles. The health of the patient, which, before the opening of the abscess, had not been sensibly affected, sooner or later becomes deranged ; the pus acquires a fetid odour and irritating qualities, which produce inflammation of the sides of the opening through which it flows : it is absorbed by the lymphatic vessels, and disturbs the functions of the animal economy. Emaciation and hectic fever supervene, colliquative diarrhœa soon succeeds, hectic fever and consumption progress, and the patient sinks under a frightful marasmus. On dissection, we constantly find the bodies of one or more vertebræ carious, and sometimes the posterior extremity of one or more ribs.

When the opening of the tumour is small, and the fistula narrow and tortuous, the air enters with difficulty, and the patient may live a long time, one or two years, for example : but when the opening of the abscess is large, and the sinus leading from it to the carious vertebræ short and direct, and the caries occupies a large extent, the progress of the disease is much more rapid, and the patient soon dies.

From what has been said, it may be concluded that the prognosis of abscesses by congestion is always bad ; for, in fact, as nothing can remedy the caries of the vertebræ, the death of the patient is inevitable.

Since abscesses by congestion are uniformly fatal, we should endeavour to prevent them. When we are called to a patient who complains of a constant pain in the lumbar region, we should neglect nothing to discover its cause. If, by the questions we put to him, we learn that this pain is caused by onanism, this pernicious habit must be corrected, by showing him the danger of persisting in it. If there be reason to believe that the pain depends upon a morbid principle affecting the vertebræ, their cartilages or ligaments, we may apply to the inflamed part a blister or moxa. It is true, that when the disease has existed some time, these remedies become useless ; but there is no inconvenience in having recourse to them once, or oftener, while the tumour is not visible ; at the same time we should give internally the juice of bitter plants, antiscorbutics, sudorifics, &c.

When the abscess is formed, all drains are useless, and serve only to torment the patient. We must direct our views to the means proper to retard the approach of death. Now it is found that the death of the patient, and all the symptoms which follow the opening of the tumour, depend upon atmospheric air. It is not known whether this fluid acts upon the sides of the cavity, and so modifies their action that pus of bad quality is produced; or whether it acts upon the pus itself, directly altering its qualities. This knowledge of the bad effects of air upon abscesses by congestion, has led all practitioners to defer opening them as long as possible. I have myself proposed, and taught this doctrine, without restriction, until very lately. But further experience, and the reflections it has suggested, have led me to a change of opinion, and a reform of practice, in this respect.* At present I do not hesitate to open abscesses by congestion, the moment they appear externally with visible fluctuation. These are my reasons for doing so. In these abscesses, the danger arises from the extent of the caries and the size of the abscess. In the commencement of the disease, the caries is very limited; but it gradually augments by time; so that in old cases we find, on opening the body, the vertebræ carious to a great extent: so with the abscess; it is at first of inconsiderable size, but it augments as the pus increases. In considering abscesses in the double relations of extent of the caries and quantity of matter, we readily perceive that they must be dangerous in proportion to their age and size; for, on the one hand, the hope of curing the caries must be inversely to its extent; and, on the other, the magnitude of the abscess renders the approach of its sides more difficult,—the suppuration more copious, and the access of air more injurious.

It is therefore with the view of preventing the increase of the collection, and the progress of the caries, that I make an early opening into abscesses by congestion; but before making this opening, we should inform the friends of the dangerous nature of the disease, and of the fatal effects which may follow. In making the opening, we ought to take all possible precautions against the entrance of air, lest it make a dangerous impression upon the sides of the abscess, and upon the pus, which always stagnates in it in greater or less quantity. The caustic potash, which is commonly applied to open these kinds of tumours, has the inconvenience of making the opening with loss of substance,

* See note B.

which cannot be closed at pleasure, to moderate the discharge of pus; by which means the sides not contracting soon enough, the air takes the place of pus, and exercises its pernicious influence upon the diseased parts. The seton so much praised by some authors, would be preferable to the caustic, but it makes the openings too large, and they become still larger when the sides suppurate. Puncture, made in the manner we have pointed out in speaking of cold abscesses, is undoubtedly the best means we can employ in abscesses by congestion; but as the access of air is injurious in this as well as other kinds of abscess, we should make the incision with a very narrow bistouri, plunging in this instrument very obliquely, while the skin is stretched tightly, so as to stop the exit of pus when the skin is loosened, (the external opening being at a distance from that into the sac,) and draw only a moderate quantity of pus at each puncture. Thus we favour the gradual contraction of the sides of the sac, and the diminution of its cavity. This method does not hinder the patient from dying, but it prolongs his existence. The rest of the local treatment consists merely in keeping the parts clean. The opening is covered with a plaster of diacholon cum gummis, and if it remain fistulous, the dressing is to be changed frequently, especially if the suppuration be abundant. If the borders of the fistula inflame, they should be covered with cerate. Bitters, especially cinchona, should be given, to prevent or retard the effects of the absorption of pus.

We shall conclude our observations on abscesses by congestion, with some cases of this dreadful disease.

CASE I. M. Seguin, a native of Paris, aged eighteen years, of a feeble constitution, was attacked, toward the close of the year 1799, in consequence of diarrhœa, which lasted three months, with constant dull pains, affecting alternately the articulation of the lower extremities and the lumbar region. These pains became gradually more intense, especially in the loins, to which they were exclusively confined at the end of three months. Baths were used to moderate them, but without effect. Afterwards there appeared at the right, lower, and lateral part of the abdomen, a small tumour, without pain, or change in the colour of the skin. This tumour gradually increased in size, and as it increased, the pains in the loins diminished, but did not cease. Another tumour appeared in the articulation of the left femur with the pelvis. The patient entered the Charité on the 10th of July, of the year 1800, about twelve months after the first accession of pain, and three or four after the

formation of the tumour, which then had an oval form, was circumscribed, soft, yielding easily to pressure, elevated to a point in the centre, where the skin was very thin. The pains in the articulation of the femur with the ilium were very severe, and augmented by standing, but still more by walking. The patient had a pale, sallow countenance; was weak, but without fever. I readily discovered the nature of the abscess, and, on the 17th of August, the skin being thin to a great extent, I plunged a narrow bistouri into the lower part of the tumour. The opening was two or three lines in extent. A large quantity of thin, inodorous, whitish pus was evacuated. A plaster of diacholon cum gummis was applied. The next day the opening had closed, and the tumour was as large as before it was punctured. Another puncture was made, and the pus had already acquired a disagreeable smell. The same evening fever came on, with great heat in the skin, intense thirst, insupportable headache, and slight diarrhœa: the pain in the loins continued. The second opening remained fistulous, and large quantities of ill-conditioned pus were discharged. I ordered injections of the decoction of bark. The patient was put upon the use of a solution of gum arabic, with sugar and diascordium. The fever and diarrhœa ceased on the 4th of August, but only for a few days; and, in the course of this month, the patient became much more emaciated, weaker, and less inclined to take food. In the following month, increase of fever, with several paroxysms, at intervals towards evening, of irregular chills, continuation of the lumbar pains, colliquative diarrhœa, great dryness of the skin, general debility, and marasmus; the edges of the fistula having opened, became very painful, and the injections were stopped. On the 2d of October, profound stupor, delirium, dry tongue, suppuration less copious and more fetid. The following day, alternate delirium and calm, frequent stupor, increase of colliquative diarrhœa, complete marasmus. The 11th, meteorism, laborious respiration, with rattling, profound coma. The patient died at mid-day. On dissection, we found the bodies of the three last lumbar vertebræ, their cartilages, and the anterior part of the sacrum, wholly destroyed by caries; the iliac and psœæ muscles forming a kind of pouch filled with pus. This pouch communicated with the fistulous orifice and carious parts. The femoral articulations were healthy, the kidneys large, the ureters and their cavities distended.

CASE II. John Buttels, taylor, aged thirty years, of good constitution, and never having had any diseases but

venereal affections, for which he was very well treated, began to feel, in the month of May, of the year 1801, vague, heavy pains in the vertebral column. These pains soon became confined to the right side of the loins. At first they were slight, and did not prevent the patient from working; but they progressively increased, and became so severe at the end of eight months, that he kept his bed. However, he attributed his complaints to cold, and took no medical advice. After resting three or four weeks, he was able to sit up, but towards the middle of January, a small tumour formed on the right groin, which gradually increased, without pain, or change in the colour of the skin. Taking this for a venereal bubo, he entered the hospital destined to these complaints, and being there undeceived, he went off without undergoing any treatment; but his health declining, he was brought to the Charité on the 16th of April, of the year 1802. The tumour was then as large as a hen's egg, fluctuating, and without change in the colour of the skin. The patient was put on a proper regimen. At the end of eight days, the tumour being evidently elevated to a point, and threatening speedily to break, I opened it, with the precautions I have laid down. There came through the incision, a great quantity of inodorous pus, in which floated numerous small, whitish flocculi. I put over the opening a small quantity of lint, which I retained by compresses. The opening did not close. The following days, a plaster of litharge was substituted for lint; the pus became fetid, and continued to be discharged in great quantities; the lumbar pains ceased, the wound became fistulous, assumed a round form, and very quickly grew to the size of a piece of fifteen sous.* Above, it exposed the commencement of the fistula, and below, at the outer and external part, a cavity, where the purulent matter accumulated, and from whence it was only discharged by the pressure that was applied above.

The weakness of the patient went on increasing until the 2d of June, when fever supervened. The suppuration then became less abundant, and, at the end of some days, the patient was troubled with a dry cough, which was soon attended with expectoration of a yellowish puriform matter. The slow fever, the sweats, and diarrhœa, which continued until the end of the month, and the pneumonic symptoms which remained until the middle of the month of June, so exhausted the strength of the patient, that he could not

* A circular piece of money, about three quarters of an inch in diameter. TRANS.

move his body in the slightest manner. In the commencement of July the diarrhœa diminished, and the suppuration increased a little. The eyes became sunken and dull; the complexion was an olive colour; the skin dry and rough. The smallest quantity of aliment oppressed the patient, and excited cough; his voice sunk; his pulse became extremely weak and small. Finally, having reached the most frightful degree of marasmus, he expired on the 24th of July. On examining his body, we saw a little fistulous opening communicating with the sack, situated at the right anterior superior side of the abdomen, and formed in the cellular tissue of the peritonæum, which, in this place, was thickened and condensed. This sac communicated with the fistulous canal, passing before the *psoæ museles*, and afterwards behind the diaphragm to the bodies of the two or three last dorsal vertebræ. The right anterior and lateral part of which, as well as the posterior extremities of the corresponding ribs, was carious. The caries affected also the three first lumbar vertebræ; the left lung was in a great measure destroyed by suppuration, and the cavity of the chest on that side contained a great quantity of fetid pus.

CASE III. In the month of July, of the year 1804, I saw, in consultation with M. Guillotin, Regent of the Faculty of Medicine of Paris, L. D. Peureux, aged nineteen years. This young man had a tumour at the upper and anterior part of the left thigh. It was indolent, without heat, or change in the colour of the skin, with a sensible fluctuation. This tumour increased in size, and became more tender when the patient was about; it diminished, and became softer when he laid down. Peureux informed us that he had enjoyed good health until the age of twelve or thirteen years, when he began the habit of masturbation, and carried this pernicious practice so far, that he fell into a state of debility and languor, which led to an apprehension of the most complete marasmus. Alarmed at his situation, he endeavoured to correct his habits; but all his efforts in this respect tended only to diminish, without destroying them. The air of the country, good nourishment, and, above all, a rigid watchfulness, which his parents constantly maintained over him, effected some improvement in his health; nevertheless, he continued to feel in the lumbar region a pain accompanied with weakness, which had long existed. This symptom very soon increased, and obliged the patient to bend forward. A tumour quickly appeared in the groin, gradually increased, without pain, and finally reached the state in which we have described it. We

judged that this disease was an abscess by congestion, which would prove fatal. The parents of Peureux, not being able to take care of him at home, he entered the hospital of Charité, the 26th of July, of the year 1804. On the 29th I plunged into the tumour a narrow bistouri, and drew through the opening about six ounces of yellow serous pus, in which floated some flocculi of albumen. I afterwards brought together the sides, and covered the orifice with a plaster of diacholon eum gummis. On the 30th it had entirely healed. On the 6th of August I made a second puncture, and discharged as much pus as at the first time. The edges of this incision, united with the plaster of diacholon eum gummis, healed in two days. On the 12th a third puncture was made, but only a small quantity of pus was discharged, on account of the flocculi of albumen, which stopped up the opening. On the 30th the patient complained of severe pain. On the 5th of September the tumour and pain had considerably diminished.

On the 12th one of the punctures opened, and a great quantity of serous pus was discharged. This liquid, which until then, had no odour, quickly became intolerable; a slow fever supervened, with diarrhœa, and his strength declined from day to day. On the 24th of October the patient complained of pain in the left lumbar region, where I discovered a fluctuating tumour. Compression made upon this tumour caused a great quantity of pus to be discharged through the puncture, which had opened, and whose edges were separated and inflamed. All the symptoms went on increasing, the marasmus became excessive, and Peureux died on the 29th of January.*

On opening the body we found a large sinus, which extended from the tumour in the groin to the first four lumbar vertebræ, which were carious to a great degree. From the tumour in the loins, a large quantity of sanious matter was discharged. The abscess which contained this communicated with the sinus of which we have spoken, in the spot corresponding to the diseased vertebræ.

* See note C.

CHAPTER III.

Of Gangrene.

GANGRENE is the death of a part of the body ; that is, the perfect abolition of its sense, motion, and organic action. This last condition is essential to a definition of gangrene ; for all sense and motion of a part may be destroyed, and yet its life preserved, as we see in paralysis—a disease in which the organic motion of the vessels is not destroyed.

Gangrene ought not to be confounded with local asphyxia, or the state of apparent death of a part ; for, in the last disease, the life being only suspended, may be again restored. Thus gangrene is to local asphyxia what death is to general asphyxia. There are some examples of local asphyxia, in which the heat, sensibility, and motion, the pulsation of the arteries, in fine, all the phenomena of life, after having appeared annihilated for some days, are gradually re-animated, and resume all their vigour. De la Motte relates the case of a billiard-table boy, whose right hand was so asphyxied, by a blow of a stick on the external part of the arm, that it appeared dead for ten days ; but at the end of this time, the heat returned gradually, the pulsation of the arteries was perceived, and the hand restored to its natural state.

When the principal artery of a limb is tied, it has been believed by some, that it was deprived of life ; because, below the ligature, it showed neither sensation, motion, nor pulsation of the arteries. However, it often happens, that after having remained in this state some time, it revives by degrees.

It is important to distinguish this state of local asphyxia from gangrene ; because otherwise we should be inclined to amputate a limb capable of being restored to life, or perform operations which would be followed by results more or less injurious. We shall avoid this serious mistake, if we observe, that in the case of a limb apparently deprived of life, the cuticle is not detached, as in gangrene ; and we do not find that putrid dissolution, nor the fetid odour which is peculiar to this disease.

Nevertheless, putrid dissolution and gangrene are not to be regarded as identical. In fact, mortification always precedes the putrid dissolution, or that kind of fermentation

which destroys the organic structure of a part affected with gangrene, and disengages several of its elements in the form of gases of a fetid odour.

It is true, that in many instances of gangrene, the affected part is so speedily separated by sloughing, that the symptoms of putrefaction appear almost as soon as those of mortification; but we ought not the less to distinguish these two states, which have been confounded by several authors. We observe them well marked, and regular in succession; in the gangrene which results from tying the principal artery of a limb, and that produced by cold; for in these two cases we evidently see that life is extinct in the part, some time before the developement of the phenomena of putrefaction.

When gangrene is confined to the common integuments, and to the subcutaneous cellular tissue, it receives the name of gangrene simply. It takes the name of sphacelus, when it affects the flesh, the vessels, and the bones themselves; in a word, when a limb is mortified throughout its whole thickness. But gangrene and mortification are, in fact, but two degrees of the same affection, and the distinction which several authors have made between them, are not founded on good grounds. In fact, gangrene is the absolute death of the part which it affects. If the life of a part be not entirely destroyed, it may be recalled, and no gangrene exists. Thus the name of gangrene, which has been given to that state of the parts in which the weakness of the vital powers only threatens mortification, is evidently misapplied.

When the cause of gangrene drives to the part affected a large quantity of fluids, swelling precedes mortification, and the humours confined there soon run into putrefaction. The gangrene is then called humid.

If, on the contrary, the cause of the disease hinder the approach of the fluids from the beginning, if it affect a part which contains only its natural quantity of them, as this cause then acts by coagulating the liquids and the solids, the member diminishes in size, the flesh shrinks like tanned leather, and is harder to cut than a living part. In this case the gangrene takes the name of dry gangrene.

The progress, the phenomena, and the curative indications of gangrene, differ according to the causes which have produced the disease. These causes are external or internal. We proceed to treat successively of gangrene produced by each.

ARTICLE I.

Of Gangrene from external Causes.

The external causes which may produce gangrene are, inflammation, contusion, slow compression, burning, congelation, and the interception of the course of the fluids.

SECTION I. *Of Gangrene produced by Inflammation.*

Inflammation is one of the most frequent causes of gangrene. It produces it in two very different ways, which are always to be kept in view in the treatment of this disease: sometimes mortification results from the violence of the inflammatory engorgement; sometimes it is owing to the malignity of the cause of the inflammation, which is the most frequent. But this last kind of gangrene is referred to that from an internal cause. We shall here treat only of that which results from the intensity of inflammation.

Life being kept up only by the passage of the blood from the arteries into the veins, when the inflammatory engorgement is carried so far as to intercept entirely the course of the fluid, which ought to transverse the vessels of a part, the vital motion is extinguished, and the part falls into gangrene.

When gangrene is a consequence of superficial inflammation, such as erysipelas or phlegmon, it is confined to the skin and cellular tissue; and it is worthy of remark, that this last mentioned part is of all others the most prone to mortify. Hence we often find the cellular tissue gangrenous without the skin's having lost its life, and sometimes not even its colour. This occurs especially after urinary infiltrations; the urine immediately renders the cellular tissue gangrenous. When inflammation, instead of affecting the subcutaneous cellular tissue, is seated in the cellular tissue between the muscles, or in the substance of them, as in comminutive fractures and gun-shot wounds, the afflux of humours which ensues, distends the aponeuroses: these compress strongly the parts which they enclose, and which are the seat of the swelling, and this compression arrests the course of the blood, and destroys the life of the whole limb. In this case, the gangrene was attributed by Quesnay to the strangulation, which he regarded as one of its most frequent causes. The opinion of Quesnay having been almost universally adopted, it may be proper to inquire, if we can

admit that gangrene is caused by strangulation in the sense of this author. According to him, the strangulation results from the compression made upon the vessels, and upon all the other parts which enter into the composition of a limb by the aponeurosis which surrounds it, and by strangulating in this manner the muscles and vessels of the thigh, in inflammation of this limb, the fascia lata may occasion gangrene.

But in order that the aponeuroses should produce gangrene by thus strangulating the limbs which they envelope, it would be necessary for them to possess a contractile power, and that this should be sufficiently strong to tighten them to a great degree. Now it is very doubtful, if the contraction of the aponeuroses be ever strong enough to produce gangrene: for frequently we exercise upon the whole length of a limb, by means of bandages, a stronger pressure than could be made by the aponeurosis, if it were endowed with contractile power; nevertheless, gangrene rarely results from it.

However, the aponeuroses contribute to extinguish the vital principle in the soft parts, by compressing them; but this compression, which is not at all owing to contractility, is only exercised on certain occasions, which I am going to exhibit in a succinct manner.

I suppose, in a complicated fracture of the former, an irritating cause, a splinter, for example, runs into the soft parts, where it excites a severe irritation. This irritation, added to that which the accident has occasioned, and especially the irritation of the nerves which it causes, may soon produce engorgement of the muscles, and inter-muscular cellular tissue, by the afflux of humours which it occasions. But as the fascia lata has an extent proportioned to the size of the thigh, as it possesses elasticity in proportion to the density of its tissue, it follows, that it yields with difficulty to the augmentation of the parts it contains, and exercises by reason of its elasticity, a pressure which confines the vessels, and endangers their vital powers. By occasioning in this way the strangulation of the subjacent parts, the aponeuroses contribute to produce gangrene. But they do not produce strangulation, except by acting like a ring about a finger which has become inflamed. It is not the diameter of the ring which is diminished, but that of the finger is increased. Strangulation then, which is regarded as the frequent cause of gangrene, is only a particular circumstance resulting from the swelling occasioned by the irritating cause, which attracts the hu-

mours into the parts situated under the fascia of a limb, as we see oftentimes in comminutive fractures. In some of these fractures, the swelling becomes enormous in two or three days. Thus, not only the parts situated under the aponeurosis, but also the subcutaneous cellular tissue, and the integuments themselves, are swollen.

When gangrene results entirely from the violence of inflammation, and the strangulation which it induces, these are its symptoms and progress.

Inflammation, which was the primitive state of the disease, and all the phenomena of which, such as heat, redness, tension, &c. had risen to a great height, diminish in proportion as the engorgement becomes excessive, and this seldom takes place before the seventh or eighth day, the play of the arteries being hindered by the blood which fills them, the heat gradually diminishes, and the part becomes cold.

The tumour sinks, the lively red of inflammation becomes more deep, and quickly changes from violet to black. The sensibility diminishes, and is soon entirely lost. The muscular contractility and elasticity are destroyed; the flesh becomes compact and clammy, the epidermis is detached, and forms phlyctenæ, which contain blackish serum: finally, the part exhales a fetid cadaverous smell, the effect of putrification, which has affected the fluids and solid parts. This odour *sui generis* is so characteristic of mortification, that, an experienced surgeon, the moment he perceives it, is sure that he is near a person affected with gangrene.

If the gangrene be superficial, we see an inflammatory circle form about the dead part, suppuration commences, the eschar loosens, and soon becomes entirely detached.

When the disease extends more deeply, and the engorgement affects the whole limb, inflammation also supervenes about the dead part; but it is sometimes difficult to know whether the gangrene is confined to the skin and cellular tissue, or whether it penetrates more deeply: we cannot positively ascertain this point, without cutting into the gangrenous parts. If an incision, made to a certain depth, occasion pain and a flow of blood, we may conclude that gangrene has not seized the whole thickness of the limb; but if very deep incisions cause no pain, it is a proof that the limb is gangrenous throughout; in a word, that it is sphacelated.

The prognosis of gangrene is always unfavourable, since it leads to the destruction of a part of greater or less extent and importance; but the seriousness of the disease

greatly varies, according to its seat, its extent, and the nature of the parts affected. Gangrene, confined to the interior of a limb, and affecting only the skin and cellular tissue, is not a very serious disease. Nature separates the eschar, and the simple ulcer which follows heals easily and quickly, especially when the skin has not been destroyed to a great extent. Nevertheless, when gangrene affects the skin which covers tendons, bones, and articulations, the prognosis is more serious.

In fact, at the falling off of the eschar, the tendons or the bones below are denuded, and almost always exfoliate. The joints may be interested, the synovial capsules opened; then the liquid which they contain flows out, the air produces an injurious effect upon the articular surfaces, and very serious symptoms may ensue.

When gangrene penetrates through the whole thickness of a limb, and sphacelus takes place, the patient necessarily loses it, and the most we can hope is to save his life.

If gangrene affect a limb near the trunk, it is still more dangerous; for then it either affects the trunk, and the patient dies, or the line of demarcation takes place near the trunk, and the whole limb is lost.

Gangrene, affecting internal organs, is almost always fatal; nevertheless, a portion of intestine may mortify, and the patient survive. This is sometimes observed in strangulated hernia.

Gangrene presents three general indications. 1st. To prevent the disease when it is not yet formed. 2d. To arrest its progress after it has come on. 3d. To facilitate the separation of the eschars, or to cut off, according to circumstances, the gangrenous part, and to treat the ulcer which results. These indications are fulfilled by different means, according to the cause of the disease.

In the cure of inflammation which threatens gangrene by extreme congestion, the object is to reduce the size of the part, and to free it from a surcharge of fluids. Diet, bleeding, diluting and cooling drinks, relaxing and anodyne applications, are the means by which these indications are fulfilled. Bark, which some practitioners have regarded as specific against gangrene, would here be injurious, by adding to the irritation already existing.

In certain inflammatory swellings, particular means are required to prevent gangrene. When tendinous expansions oppose the developement of the swelling, and re-act upon the inflamed part, so as to arrest the circulation of the fluids, we ought, at an early period, to cut them, in order to loosen

the limb, and take off the strangulation. In this manner we prevent the gangrene of a strangulated intestine, by cutting the herniary ring.

When these means, carried as far as possible, do not succeed, and we see the tumour sink, the heat diminish, the redness obscured, the elasticity destroyed, the flesh becoming compact and clammy; when, in fine, we observe the signs of the cessation of vital action in the swollen part, bleeding is useless, as well as topical emollients. We must then have recourse to remedies which excite the organic action of the vessels, such as cataplasms composed of the powders of aromatic plants boiled in wine, a strong decoction of bark, with camphorated spirits, &c.

But as, in a very extensive inflammation, gangrene appears first in a part where the inflammation is most violent, this part should be treated differently from the rest. If, for example, in a violent inflammation of the leg and foot, the latter change from red to violet, if its sensibility and heat diminish, if, in fine, it be threatened with gangrene, certainly it is proper to apply antiseptics to the foot; while the leg, which yet preserves its heat, redness, and sensibility, requires emollient relaxing remedies.

It has been proposed to make, in a part threatened with gangrene, scarifications or incisions, to favour the action of applications to the parts which are not yet gangrenous: but either the vital action has ceased in the affected part; in which case, beside the inutility of scarifications, they expose it to the contact of the air, and accelerate putrefaction: or gangrene does not exist; and in this case scarifications are injurious, as well by irritating parts threatened with gangrene, and increasing their engorgement, while they have yet a certain degree of vital power, as by throwing these parts into a state of debility, and thus accelerating mortification. Here scarifications produce the same effect as in parts extremely infiltrated. We know that these parts almost always mortify soon after the escape of the serum. The symptoms first appear on the incised parts, and extend to its environs. On these accounts, all good practitioners forbid every kind of incision, to prevent mortification; and when they do make them, it is only, as we before observed, to ascertain, in a doubtful case, the depth of the gangrene, and to distinguish it from sphacelus.

When gangrene has ceased to extend, we should endeavour to fulfil the third indication we have laid down, which consists in favouring the separation of the eschars in superficial affections, and amputating the limb, if it be sphacelated.

When mortification has ceased to progress, there appears, as we have said, about the gangrenous part (which has become truly a foreign body,) a slight inflammation; the vermilion colour of which distinguishes it from that inflammation which indicates the further progress of the disease, and which is of a violet colour.

The inflammation which surrounds the gangrenous part, is quickly followed by suppuration, and then we begin to perceive, between the dead and living parts, a line of separation, the depth and breadth of which daily increase. The pus is at first a little sanious, and in small quantity; gradually it becomes more abundant, and of better quality, and, at the same time, the gangrenous parts lose their connection with the neighbouring sound parts. This union diminishes more and more, and finally ceases altogether.

The time which nature employs to separate the dead parts from the living, is longer or shorter, according to the strength of the patient, and the degree of vital energy in the sound parts which bound the gangrene. Thus the skin, of which the life is more active than that of the cellular tissue, sooner separates from the gangrenous eschars.

It is, then, truly nature which separates the gangrenous parts, by means of inflammation, and the suppuration which follows it. If art attempted to affect this suppuration, it would cause much pain, and might contribute to the progress of mortification, by laying bare parts whose vital action is weakened, and often almost extinguished.

To favour the establishment of suppuration, if the inflammation be languid, we should employ tonic and strengthening medicines; and, in the contrary case, have recourse to emollient and relaxing applications. As to the gangrenous part, it is commonly covered with a plaster of styrax; but the strong odour of this medicine, added to that of the gangrene, is insupportable to the patient. Dressing this part is absolutely useless, because topical applications have no effect upon parts deprived of life: it is sufficient to apply to the part some substance calculated to check its putrefaction, such, for example, as bark in powder.

When the gangrene is superficial, we ought to cut the eschars as they are detached, in order to diminish the infectious smell they send forth; but in removing the eschars, we must be careful not to stretch, much less to cut, the living parts, in order to spare the patient useless and injurious pain. The separation of the sloughs leaves a simple ulcer, which cicatrizes like a wound with loss of substance.

When gangrene affects an entire limb, we wait until nature

has drawn the line of demarkation between the dead and living parts, by the developement of the inflammatory circle, and then we amputate. There are, however, some examples of sphacelated limbs, which have been separated from the living parts by the efforts of nature alone. But art should spare nature this long and painful labour, during which the limb putrifies, and exhales an insupportable odour; beside, the putrid humour continuing in contact with the living parts, may be absorbed, and slow fever is a necessary consequence. These consequences are prevented by amputation. But in what place shall we amputate? Formerly, it was advised to amputate in the gangrenous part, in order to prevent pain and hemorrhagy: this was at a time when the use of the ligature was unknown: afterwards it was proposed to amputate in the living part, in order to spare nature the work of separation. This is the doctrine of the present day. If the sphacelus occupy a leg, amputation is practised in the place of election, provided the disease do not extend beyond it, because we must not leave the patient an inconvenient stump. If the gangrene should extend farther, we should saw the tibia above its articulation with the fibula. The amputation of the thigh, arm, and fore-arm, ought always to be made in the line which separates the dead from the living parts, following, in other respects, the rules which relate to this operation, and which we shall lay down hereafter.

But before determining upon the operation, we must be very certain that the progress of sphacelus is arrested. This precept, applicable to all kinds of gangrene, regards especially that which depends on an internal cause. Premature amputation often terminates fatally, compromising at once the reputation of the surgeon and his art.

SECTION II. *Of Gangrene produced by Contusion.*

Contusion, of which we shall hereafter particularly treat, is a frequent cause of gangrene. It produces it in two different ways. 1st. By injuring the texture of the solids, and destroying entirely their organic action. 2d. By excessively weakening this action.

In violent contusions, when the organization of the flesh is entirely destroyed, the parts should be considered as dead, that is to say, gangrenous. Gangrene is then the immediate result of the contusion. The fluids contained in the vessels of the bruised part are infiltrated; they putrify, and their dissolution is quickly followed by that of the whole

part. The disorganization produced by contusion is sometimes superficial, confined to the skin and cellular tissue, constituting gangrene strictly so called; sometimes it extends through the whole limb, and sphacelus is the result.

Abandoned to itself, a part entirely deprived of life by a severe contusion, quickly falls into gangrene. The living parts which border on it, being contused, but in a lesser degree, suffer an afflux of fluids, and are consequently swollen. Sometimes the swelling and tension are so severe, that gangrene soon follows; and when the affected part is large, like the arm, the leg, or the thigh, the inflammatory swelling extends so far as to affect the trunk, and proves fatal. Contusion, without being strong enough to disorganize the parts, may, nevertheless, produce gangrene, by so enfeebling the organic action of the flesh, that it falls, so to speak, under the weight of the liquids which flow into it. This enfeebling of the organic action of the flesh is one of the most remarkable, and, at the same time, most dangerous effects of contusion. It is accompanied sometimes by interior rupture, whence results an infiltration of the blood into the cellular tissue, which accelerates still more the progress of mortification.

In great contusions, the swelling of the parts is not confined to those of which the organic action and sensibility are almost extinguished, and which cannot carry on the fluids which the circulation constantly brings them; it extends also to the parts on which the instrument acted with less force. But as the vessels of these parts preserve all their organic action, and their nerves have experienced very great irritation, it results that the swelling is inflammatory, and susceptible of terminating by resolution, by suppuration, or by gangrene; during which time the parts most violently contused are soft, flabby, indolent, and almost always become gangrenous. When the contusion disorganizes immediately any part, so that its vital action is completely destroyed, the treatment to be pursued varies according to the extent of the disorganization. If the contusion have only disorganized the skin, whether there be a solution of continuity or not, we should leave to nature the separation of the deadened parts; apply to the neighbouring parts applications proper to prevent too great inflammation, to moderate it when it exists, and remove the eschars in proportion as nature separates them. But when the contusion has disorganized a limb throughout its whole thickness, we should compromise the life of the patient by trusting to nature the separation of the disorganized parts.

However, if the member affected be small, as a finger, for example, we should not then endanger the patient's life by trusting the separation to nature; but a large irregular wound would result; the healing of which, naturally difficult, would be rendered still more so by the presence of some splinters of bone, and the cicatrix would be irregular. But if we amputate the finger in the articulation next above the disorganized part, by preserving flaps of flesh as well as the case allows, the wound which follows soon heals, and the cicatrix is regular.

If the member disorganized by a violent contusion be large, if it be the foot, the hand, the leg, &c. and we leave the separation of it to nature, two inconveniences result from this conduct; the first and greatest of which is the risk which the patient runs from inflammatory symptoms; for when these symptoms come on, we in vain oppose them by copious bleeding, low diet, and the other antiphlogistic means. The second inconvenience is, that supposing the patient escape the primary symptoms, and nature separate the disorganized part, an irregular wound follows; in the centre of which we commonly find the bone broken, and splinters extending to a distance. The bone becomes diseased, and prevents the healing of the wound; and the patient, if cured after a very long time, has an irregular stump, and sometimes a part of a limb, which is very disagreeable and inconvenient by its length, as we observe when the foot, or the inferior part of the leg, has been sphacelated. When we determine on amputation, we pay attention to the impression which the contusion has made upon the whole system; for if there be stupor, general commotion, delirium, general reduction of strength, indicating an affection of the sources of sensibility, we may infer that the operation would be useless, and we should wait for a more favourable opportunity to perform it.

When the contusion has not been so great as to disorganize the part, and gangrene is to be apprehended from the extent of the swelling, and it quickly appears, we should employ the remedies, external and internal, proper to prevent inflammation: thus we should have recourse to bleeding once or oftener, according to the strength and temperament of the patient, and the violence of the contusion. We should employ, during the first days, such remedies as are proper to prevent the afflux of fluids, such as resolvers, and even repellents. But when there is too much inflammatory tension, we should renounce these means, which, by checking the action of the solids, would produce mortification,

and in their stead apply emollients to the inflamed parts, while that in which the life appears almost extinct, should be covered with the tonic antiseptics of which we have spoken. If, notwithstanding these precautions, gangrene supervene, we should ascertain its extent, and act accordingly; if superficial, we should leave it to nature, promoting, however, suppuration, and the separation of the eschar, by emollient applications: if sphacelus exist, we wait until nature has drawn the line of demarkation between the living and dead parts, and then have recourse to amputation.

SECTION III. *Of Gangrene produced by slow Compression.*

If a part suffer a strong and continued pressure, its vessels become debilitated, the fluids circulate in them with difficulty, and finally cease to enter them at the end of a longer or shorter time; thus pressure unequally made by splints in fractures, particularly of the leg and thigh, often produces gangrene in the most prominent parts of the limb. In the same way are caused those gangrenous eschars that appear on the bodies of persons long confined in bed. They are, in fact, produced by long-continued pressure, to which, however, the cause of the disease itself may be added; and, in this case, it is the irritation induced by pressure which throws the disease upon the part. Thus we remark, in these cases, that gangrene extends much more rapidly than when it arises from pressure alone. Unclean linen may also render compression more injurious; but it is not essential to the production of gangrene, for we often see it in the rich, who are able to procure themselves every convenience, and to guard against filth.

When the gangrenous eschars produced by compression lead the patients to a change of position, new eschars form in the prominent parts, which the last position compresses most. Thus, when a patient, whose sacrum is affected by remaining long on his back, changes to one side, new eschars form on the trochanter major. Sometimes both trochanters become affected in this way. I have seen a barber, whom a severe venereal affection confined to his bed for a long time, with eschars in all these different parts; he was finally obliged to rest on his knees and elbows, which soon became gangrenous, and he died.

Parts situated under these eschars become, in the end, affected by the continued pressure: hence the sacrum is often the seat of necrosis.

Madame de C—— had a palsy of the posterior muscles of the neck : her head, by its gravity, and the action of the flexor muscles, fell forward ; the lower jaw pressed upon the upper part of the chest, and its inferior part became gangrenous ; a part of the maxilla inferior, divided by the separation of the eschar, became affected with necrosis, and a portion detached itself. I have also seen the acute edge of the ear opened in several parts by long-continued pressure.

When we perceive a patient, after having remained in the same position a long time, with some of the parts which have borne his weight, red, excoriated, and threatened with gangrene, we must often change his position, keep him very clean, and cover the parts with Nurenburgh or diachylon plaster, and keep them from being pressed upon, by putting hair-pillows above and below them.

When the eschars are formed, we may cover them with plaster of any kind : suppuration takes place, the eschars fall off, and leave an ulcer, which is to be dressed as a simple ulcer, and is readily healed, provided we can save it from pressure. As to the eschars which form on the prominent parts of a fractured limb by the pressure of the splints, they also should be covered with a plaster, and the pressure taken off from them.

SECTION IV. *Of Gangrene produced by Burns.*

When a substance, whose temperature exceeds that of boiling water, such as red-hot iron, is applied for some seconds to the surface of the living body, it disorganizes the solids on which it acts, and converts them into gangrenous eschars. Heated substances do not always produce gangrene immediately ; and in this respect we may compare the effect of fire with that of contusion. But as we shall treat of bruises in a particular chapter, we shall only now speak of the gangrene, which is the immediate consequence of them.

This gangrene is more frequently produced by solid bodies, which are good conductors of caloric, and have a great capacity for it ; such as the metals for example. It also often arises from the burning of the clothes, or touching a live coal. The mortification in this case is of a black colour. An inflammatory circle generally forms a line of demarkation between the living and dead parts, the gangrenous eschar separates, and the ulcer which succeeds soon heals, if it be not deep. But if the situation of the eschar lay bare a tendon or a bone, the cure will be more tedious.

Gangrene may also be produced immediately, by a heated liquid body more dense than water: then the epidermis is detached, and the skin is left bare, which, if of a yellowish colour, is certainly disorganized. Sometimes the eschar is superficial, and affects only part of the thickness of the skin. This causes an extensive superficial ulcer. At other times, it is destroyed entirely, especially if the injury have been received by burning oil, fat, or broth, which has penetrated the garments, and been retained some time in contact with the part; then the gangrenous eschar affects the whole thickness of the skin, and the ulcer which follows is much more deep, and more dangerous than in the former case.

When the burn has penetrated to the bone of a limb, and it is entirely destroyed, if the patient survive the first shock, nature quickly begins the work of separating the dead from the living parts; and we may leave to her the separation, if the sphacelus be bounded by an articulation, or terminate in the course of a small bone; but if the line of separation be over a large bone, we must amputate at a proper time.

SECTION V. *Of Gangrene produced by Freezing.*

Gangrene is frequently produced by congelation in northern climates. Very great cold diminishes the organic action of the vessels, blunts the sensibility of the nerves, coagulates the fluids, and thus suspends the phenomena of life, such as heat, sensitive healing of the arteries, &c. Hence, parts which have been exposed to intense cold, appear dead, and sometimes really are so: but often they are in a state of apparent death only, and may be restored.

Parts which have been frozen, become cold, motionless, and insensible. They are somewhat swollen and livid, not unlike parts gangrenous from inflammation. If proper assistance be not given in time, nature draws the line of separation between the dead and the living parts, suppuration takes place, and the gangrenous limb falls off. It is necessary only sometimes to cut a tendon, or some ligamentous part, when the mortification has stopped at an articulation. It is very common for parts to fall off in this way. I have seen such a separation of the toes, and of the metatarsal bones of the foot, which hung only by the tendo achillis and one of the ligaments of the joint.

It has been believed, that in extinguishing life, cold acted only by coagulating the fluids; but the phenomena of conge-

lation show, that the solids are affected also, and especially the vessels and nerves. Cold acts, as we have said, upon the first, by diminishing and even extinguishing their action ; and upon the second, by blunting their sensibility, and thus preventing the exercise of their functions.

Severe cold does not affect at once all parts of the body : those most remote from the centre of circulation become cold soonest when that circulation is suspended or diminished. Thus the toes, the feet, the lower part of the leg, feel most quickly and severely the effects of cold, and congeal more speedily than other parts of the body.

The action of cold is not always confined to external parts. When it lasts a long time, it extends to internal organs, and produces the following effects. The nerves undergo a general and painful irritation, a chilliness extends through the whole body, which becomes pale, rigid, and swollen ; sensation and motion are diminished, the circulation is weakened, the natural heat abates, great anxiety takes place, profound sleep comes on ; and, if the action of the cold continue, death ensues. In northern countries, persons often perish in this manner.

The effects of cold upon the body are great and severe in proportion as the transition has been suddenly made from heat to great cold ; and even in northern climates, where very low temperatures can be supported, a sudden increase of cold, especially if attended with wind, often causes gangrenous affections, and sudden death.

Experience has led to a treatment of congealed parts, which theory, perhaps, would never have anticipated. According to the great axiom, diseases are cured by contraries ; and heat alone would seem proper to combat the effects of cold. But all the channels of the circulation being closed, the rarification of the fluids closely retained would rupture the vessels before they could pass freely in the round of circulation, the parts which we were attempting to thaw would become gangrenous, and putrefaction would quickly affect them. This is what takes place in frozen apples : if we put them by the fire, they lose their taste, and quickly rot ; if, on the contrary, we dip them, at intervals, into cold water, and wipe them dry, they retain their flavour, and may be kept a long time.

The method of treating the effects of cold, as well local as general, is as follows. If a part of the body, a foot or hand be affected, plunge it into the coldest water at hand, or cover it with snow frequently changed. This is to be continued until the part begin to revive. While this pro-

cess is going on, we see the black and violet spots disappear, the swelling diminish, and the other symptoms gradually go off. We judge that the part is restored, when it becomes soft, warm, red, and sensible. This is the time to employ means to restore the organic action of the vessels. Frictions with warm flannels, and spirituous aromatic fomentations, or warm discutient poultices, are to be applied; at the same time we are to give internally cordial stimulating draughts, in order to revive the languishing circulation, and impart to the blood such an impetus as will carry it through the vessels of the congealed parts.

If the congelation have affected the trunk; if apparent death, or general asphyxia take place, we should make use of the same means; cover the body with snow, and rub snow on every part of it; or if snow cannot be had, very cold water may be employed; and as soon as the patient shows some signs of life, we should put him into a bath slightly warmed, and gradually augment the heat of it. Aromatic and spirituous frictions may also then be used. As soon as the patient can swallow, cordials, and especially ammonia, are to be given to rouse the organic action of the solids, and excite the motion of the blood. These means ought to be continued a long time, and we are not to despair until putrefaction commences. Experience has taught us that persons who have been frozen, and believed to be dead, have been restored to life at the end of several days. But in this case, as in that of partial congelation, the affected part ought to be placed in a temperature little above that of the open air.

In local congelation, when assistance has been given too late, or congelation has entirely destroyed the life of the part, we must wait until the gangrene is defined. When we see the inflammatory circle appear above the mortified part, when suppuration is established, we are then to decide if we will leave to nature the separation of the part, or if it be not better to amputate.

SECTION VI. *Of Gangrene produced by Interception of the Course of the Fluids.*

This kind of gangrene may be caused by tying or compressing the principal arteries of the part.

If we tie the principal artery of a limb, and the collateral branches do not furnish by their anastomoses sufficient blood for its nourishment, gangrene takes place. It is particularly in those wounds where a large vessel has been opened, or

after the operation of aneurism, that we see gangrene come on for the want of nourishing fluids. In these cases, the limb gradually becomes cold, unless we keep up an artificial heat, which might, on a slight examination, appear like natural heat. It becomes doughy, its sensibility diminishes, a great weight is felt in it; the beating of the artery is no longer perceived, but the limb is not yet gangrenous. Heat and sensibility have been known to return eight days after the appearance of symptoms indicating the loss of its life. But when gangrene results from the interreption of the course of the blood, the epidermis becomes detached, the limbs change colour, become blueish, then greenish and fetid, like a body whose dissolution has commenced. Then it is truly gangrenous, and soon becomes putrid. Sometimes the gangrene is confined to the middle of the leg, as has been often observed after the operation of popliteal aneurism. Sometimes gangrene extends up to the ligature, rarely above it.

When nature has established a line of demarkation between the gangrenous and living part of the limb, we must not defer amputation too long, lest the patient's strength fail, so as to render the operation useless.

When, after tying the principal artery of a limb, some eschars only appear, which are confined to the skin, they do not always depend upon the want of nourishing fluids. Sometimes they are occasioned by pressure from surrounding bodies: thus after the operation of aneurism, I have seen eschars appear on the toes and on the back of the foot, from deficiency of nourishment, while pressure produced one on the external ankle. The eschars are to be covered with a simple plaster in order to promote suppuration, and a detachment of them, which is not commonly obtained in this case before a long time.

We have said that the course of the fluids might be intercepted, so as to produce gangrene by compression. In fact, if we apply upon a part of the limb circular compression, sufficient to intercept the course of the venous blood, the limb soon swells, becomes livid and gangrenous. This is humid gangrene, and that produced by tying the principal artery of the limb is of the same kind. But if compression be made on the whole limb, by means of a very tight bandage, which arrests alike the circulation of arterial blood, venous blood, and lymph, then the volume of the limb considerably diminishes, and sometimes atrophy, sometimes dry gangrene follows. Atrophy may come on, if the limb was perfectly healthy, before the compression; if otherwise, dry gangrene

may supervene. This is a rare case ; however, I shall relate an example.

A young man received the contents of a fowling-pieoe in his leg, which fractured the bone ; but the fracture was not comminutive, because the shot were small. The leg was dressed with a very tight roller, which covered not only the leg but the foot ; nourishing fluids could not pass into the limb ; it grew much smaller, and was affected with dry gangrene. When sphacelus had appeared he was brought to the Charité. He was very weak, his leg extremely thin, its muscles sunken and black, with the appearance of smoked beef. One could cut them without drawing blood, or exciting the least pain. The debility of the patient not permitting us to amputate, we disarticulated the fibula, and sawed the tibia two inches below the place where the gangrene had stopped. But hospital gangrene came on, and the destruction of soft parts extending to the articulation of the knee, we were obliged to amputate the thigh.

ARTICLE II.

Of Gangrene from an internal Cause.

We consider as gangrene from an internal cause : 1st. Gangrene produced by the malignity of the cause of inflammation. 2d. That which supervenes in the course of a malignant or putrid fever. 3d. That which has received the appellation of dry gangrene.

SECTION I. *Of Gangrene produced by the Malignity of the Cause of Inflammation.*

When gangrene is produced by the malignity of the cause of inflammation, it is called malignant or gangrenous inflammation. We may refer to this kind of inflammation, carbuncle, malignant pustule, &c. of which we shall treat particularly hereafter.

The progress and phenomena of gangrenous inflammation are not always the same. Sometimes the disease appears under the form of erysipelas. The diseased part is of a deeper red than ordinary erysipelas. The patient feels a pain and heat more or less acutely in the part ; it then becomes cold and insensible, and presents to the touch a solid com-

paetness, having nothing of the tension which belongs to ordinary inflammation, nothing of the elasticity which the fluids give to living flesh ; it becomes covered with black spots, which rapidly extend ; the patients lose at once their feeling ; they are generally calm ; the pulse is weak and frequent ; it sinks, and they die when the gangrene is very extensive. There is a resource when the gangrene is circumscribed and limited to a certain space.

At other times, gangrenous inflammation affects a whole limb, and appears on the surface of those excessive swellings, which arise in communicative fractures. The part affected acquires suddenly a considerable size ; it is at first hot, tense, and painful ; but it soon becomes cold, insensible, and slightly doughy. The inflammatory redness, the shades of which are greatly varied in this kind of gangrenous inflammation, soon assumes a blackish colour more or less deep ; the pulse is small and tremulous ; the prostration of strength excessive ; the patient is in a tranquil delirium, with frequent hiccup ; the body is covered with a cold sweat, which is soon followed by death. The progress of this kind of inflammation is sometimes so rapid, that the patient dies in twenty-four hours ; at other times he lives three or four days.

Malignant or gangrenous inflammation, under whatever aspect it appears, is always caused by a morbid principle diffused through the animal economy, and killing the part where it is collected.

This inflammation is in general very dangerous, especially when the efforts of nature to throw it off have been insufficient ; for in this case a part of the morbid principle remains in the animal economy and proves fatal. But if the efforts of nature have thrown off the cause of the disease, life is preserved at the expense of the part affected.

The general indication which most naturally presents itself in this affection, is to strengthen and animate the weak and languishing vital principle, that it may resist the malignity of the gangrenous humour. Bleeding is improper, since it weakens the organic action, and instead of arresting the progress of the disease, greatly accelerates it. We are not then lightly to have recourse to this remedy in languid inflammations, which tend strongly to gangrene. There are numberless examples of inflammatory diseases, caused by malignant substances, tending directly to the extinction of the vital principle, in which bleeding would have no other effect than to accelerate death.

In order the better to understand the particular indications

in the treatment of gangrenous inflammation, we should consider its two different states, viz. that in which it is still advancing, and in which the life of the part is not entirely extinguished; and that in which the gangrene is complete, and inflammation ceases to extend from its circumference. In the first case, far from opposing the progress of this inflammation, we should excite it. It depends, as we have said, upon a malignant cause, which we should endeavour to expel by supporting the languid powers of the system with tonics and cordials, active resolvents, and even sinapisms.

In the second case, that is where all the inflamed part is mortified, we should administer cordials, and promote suppuration by emollient applications, when we see the inflammatory circle, which indicates the commencement of the process of separation. If, however, no such circle appear, we may touch the edge of the dead parts with a solution of mercury in nitric acid, or some other liquid caustic, so as to occasion sufficient inflammation and suppuration to throw off the eschar.

If a whole limb be affected, we must amputate after the sphacelus is arrested and defined. If we amputate before, the stump will mortify.

SECTION II. *Of Gangrene which appears in the Course of a Malignant Fever.*

Gangrene which comes on in the course of a malignant fever, may affect a part previously diseased, or one that is not so. A person with gonorrhœa and inflammation of the prepuce, will very probably lose this part from gangrene.

We have had several cases of this kind in the Charité. In one, the penis sloughed off smoothly; in another, so irregularly, that we were induced to amputate it; in a third, the prepuce and gland alone were destroyed.

When there is no point of irritation caused by a local disease previous to the fever, it is often a part irritated by uncleanness, or by pressure, or the weight of the body that nature selects for the deposition of the morbid principle: thus are formed the gangrenous eschars which appear at the posterior part of the pelvis, in putrid or malignant fevers. We must not confound these eschars with those of which we have before spoken, and which are produced entirely by pressure.

Whatever be the seat of these kinds of gangrene, they are regarded as symptomatic, when they appear in the commencement or height of the disease, without arresting it,

and without having fixed periods, any more than the disease itself; and as critical, when they cure it. There are many examples of acute diseases terminated by gangrene of the part. These gangrenes are salutary, when they are advantageously situated, and are not of too great extent.

When the gangrene which comes on in the course of an acute disease, is confined to the skin and cellular tissue, we leave to nature the separation of the eschar. When gangrene affects the whole thickness of a limb, art aids nature in the separation and amputation of the sphacelated part; but the operation, as we have said, must not be had recourse to until all the morbid principle is deposited, the mortification is fixed, and its limits perfectly defined.

SECTION III. *Dry Gangrene.*

Dry gangrene is that which is not accompanied by swelling, and which is followed by a drying, which prevents the dead part from undergoing putrid dissolution, without preserving it from the infectious odour characteristic of mortification.

This kind of gangrene almost always affects the lower extremities, where the vital action is weakest, perhaps on account of their great distance from the centre of circulation. It is most common in old age: it attacks men rather than women.

The symptoms of dry gangrene present many varieties; sometimes the part affected begins to grow pale, because, as we shall presently say, the disease first affects the vessels that carry the fluids to the dying part, and because heat ceases with the action of the arteries. These vessels do not contract by their own elasticity. The mortified flesh becomes more firm, more difficult to cut than living parts, and resembles leather. In this case, if we amputate the gangrenous member far above the place where the disease seems to terminate, the patient feels nothing. The flesh is not putrified, like that of a man recently dead; a little black blood alone escapes.

Patients sometimes experience a sensation of burning heat, although the part is actually cold: sometimes they feel a very painful sensation of cold. There are some dry gangrenes, which affect a part without causing pain; the patients only experience a sensation of weight, of stupor or numbness, and slight cold.

Dry gangrene is preceded and followed by considerable

changes in the colour of the part. Commonly the place which is threatened with mortification becomes red, and as if a little inflamed, without, however, any swelling, tension, or remarkable heat. The brightness of the red is quickly obscured, and it changes to a livid, and then to a black colour. Where the gangrene extends, it is preceded by the redness of which we have spoken, which may be regarded as the fore-runner of mortification; and as this redness progresses, we foresee the progress of the disease, and judge of its state by the changes it undergoes.

Blackness is one of the principal characteristics of dry gangrene, but it is not inseparable from it. We find in authors examples of gangrene, in which the affected parts became of a sallow white. This variety of the disease, which is very rare, is called white gangrene; the change of colour which takes place, does not always come on gradually, as we shall presently say, for sometimes the skin and flesh blacken immediately.

Dry gangrene is not usually accompanied by phlyctænæ; I say commonly, because we find several observations which assure us that gangrene may be dry, although accompanied by phlyctænæ. Sometimes the epidermis is detached, without forming phlyctænæ; at other times the skin and flesh dry, and become as arid as if they had lain in the sun, or been smoked.

While the phenomena of which we speak appear in the affected part, if the patient have not experienced any disease previous to the gangrene, the rest of the body is in good state, excepting sometimes lassitude, and extreme weakness of the pulse. When the cause of the disease has been entirely deposited upon the affected part, and the progress of gangrene is arrested, the lassitude disappears, the pulse becomes stronger, and we soon see, about the gangrenous part, the red and vermilion circle of inflammation, which announces the efforts of nature to separate the dead from the living parts. But when the cause of the gangrene is not entirely deposited upon the affected member, and part of this cause is diffused through the animal economy, the strength diminishes more and more, delirium supervenes, the body is covered with a cold sweat, and the patient dies. The progress of dry gangrene, usually very slow, is sometimes extremely rapid. There are examples of these gangrenes, which have been a year in extending from the great toe to the knee, while others have extended from the great toe to the abdomen in less than three days. This difference in the progress of dry gangrene depends no doubt on the

quantity and activity of the cause of the disease. The prognosis is very unfavourable, when this disease depends on an internal cause. According to Fabricius Hildanus, during forty years practice, none of his patients escaped death. Nevertheless, we find in authors a great number of cases of dry gangrene which have terminated happily, with the loss only of the part affected.

The causes of dry gangrene are external or internal. The external, which are very rare, act by intercepting directly the course of the blood, and expelling the fluids from the part they affect; such as long compression of which we have spoken. The internal causes act by extinguishing the organic action of the arteries of the parts. These causes are of several kinds. The venereal virus and scurvy sometimes produce dry gangrene. The causes of acute diseases deposited upon a part, may produce sudden mortification, without previous swelling or inflammation; but more commonly dry gangrene is not preceded by any other disease, and the cause which produces it is not known; neither its source, nor its nature, nor its mode of action. Extreme old age, and exhaustion, have been regarded as the most frequent causes of dry gangrene. It is certain that this disease attacks most frequently old and worn-out men; but it is not equally certain that it arises entirely from the exhaustion brought on by old age, since we see a great number of worn-out old men who are never affected with this disease, while others, much stronger and younger, are numbered amongst its victims. Nevertheless, it cannot be denied that old age greatly predisposes to dry gangrene, by favouring the action of the cause of this disease, perhaps even by giving birth to it, especially in persons who have abused the pleasures of love, and are tormented with the gout.

Among the causes of dry gangrene, there is one which is introduced into the body through the medium of aliment: this is the spurred rye. This name is given to a kind of rye whose stalks are only six or seven inches long, horned, and contain only some black grains without. The spurred rye is abundant in rainy seasons and damp situations: hence the gangrene which it produces becomes epidemic, as often as the wheat is scarce, and the poor are obliged to eat it when it is too new. The epidemic commences with the harvest, and terminates some months after it is over. It attacks men oftener than women, and the feet oftener than hands.

The symptoms of this disease are local and general. The extremities of the members first become numb, and motion

is greatly impeded. Dreadful pains take place deep in the part, which are increased by heat, and somewhat diminished by cold. This pain, which commences at the extremities of the toes, affects the foot, the heel, and the thigh; or perhaps from the extremities of the fingers it extends to the fore-arm, and to the arm, and terminates in a gangrene, which blackens and dries the parts, and causes them to fall off after several months. Some have been seen who have lost a leg, some an arm. There are patients who experience no pain, and who lose one or more toes without feeling it. A few lose their noses.

The general symptoms are as follows. The disease commences with lassitude without fever; the face and the whole body become pale; the abdomen swells, and becomes hard; the patient becomes stupid, and his mind is weakened in proportion to the progress of the disease. The excretion of urine and fæces is not interrupted, but the latter becomes fetid; the body wastes rapidly; the pulse is small, and so feeble as to be scarcely perceptible, except in the paroxysms of pain; for then there is a slight degree of fever, and a little sweat on the head and epigastrium. The patient nevertheless preserves his appetite; but hot food disagrees with him, occasionally causing sweats.

Dry gangrene presents three general indications: to prevent the disease, to arrest its progress, and to cure it when it has come on. To prevent dry gangrene, we must destroy the cause of the disease, or hinder its effects. This is easy, when the cause is an external compression which we can remove, and whose effects we can counteract, by taking the precautions already pointed out. But dry gangrene is rarely produced by compression. This disease, as we have said already, almost always depends upon an internal cause, which usually extinguishes the vital action of the vessels of the parts. Now no known medicine possesses the power of destroying the internal causes of gangrene, and preventing their effects; so that, when gangrene has once appeared, it continues to make progress, in spite of the opposition of art, until the cause which produced it is entirely deposited upon the part which it destroys.

Bark has been recommended by several very respectable English practitioners as the great specific against gangrene in general, and particularly that depending upon an internal cause. But late observations demonstrate, that it has no immediate action upon the cause of the gangrene, and that it acts only in arresting the progress of the disease, and favouring the separation of dead parts, produces its good effects as

a very powerful tonic. In this respect, bark is one of the best remedies that can be employed. In gangrene from internal causes, with weakness of pulse, and extreme prostration of muscular power, we cannot use the bark too soon; but when the gangrene is preceded by violent inflammation, we are not to administer it, until the inflammatory symptoms have passed by, the mortification is manifested, and weakness and sinking begin to take place. In giving the bark at this time, we have only in view the raising up of the strength, and aiding the separation of the gangrenous part.

In gangrene, when we perceive bark is proper, it is best to give it in substance. But this is often attended with a great inconvenience. The stomach cannot bear it in this form; nevertheless, its different preparations do not answer so well as the powder itself. We must, therefore, help the stomach to support it, by using, at the same time, a little generous wine, or brandy and water. As to the dose of this medicine, the rule is, always to give as much as the stomach will bear. In general, we ought not to expect good effects if the patient cannot take an ounce in twenty-four hours. A much greater quantity is often given with great success.

The prostration of the strength, and the extreme weakness of the pulse, in dry gangrene, and in all kinds of gangrene, depending upon the diffusion of a deleterious principle upon the animal economy, naturally indicate cordial remedies. The use of them is very ancient; but experience has demonstrated the little success of these remedies; and since the bark has been employed, most of the cordial preparations, of which the ancients made so great use, are rejected. Their place is supplied by old wine, in which the bark is macerated, or which is given alone, in doses proportioned to the patient's weakness.

In certain dry gangrenes, there is more to hope from regimen than medicine. This is exemplified by the following facts, reported by Quesnay, in his treatise on gangrene. A man who drank wine freely, was affected for several months with dry gangrenes, which came on, from time to time. M. De la Peyronie thought proper to forbid him the use of wine, and to oblige him to use milk and water, as his only food. The gangrene ceased, and did not return. Exhaustion, and old age, which give rise to this complaint, or which, at least, predispose to it, more or less, point out the propriety of antiseptic and strengthening food; and these aliments are equally indicated in all kinds of gangrene where the strength is lost.

The second indication in dry gangrene, relates particularly to the violent pain by which the disease is sometimes preceded. These pains depend upon the action of the cause of the disease, upon the nerves of feeling, and cease only when they are completely disorganized. Opium offers a resource against these pains, more certain than the anodynes commonly used at the present time. Given internally in a proper dose, and applied even externally, it not only moderates the pain, but it contributes also to arrest the progress of the disease, as we shall see hereafter.

The third indication is to favour the separation of the dead parts from the living. This separation is the work of nature entirely, and ought to be trusted to her. Formerly the eschars were removed, and deep scarifications were made; but experience has taught us, that these operations are always injurious. The efforts of nature to separate the gangrenous parts, are preceded, as we have said, by an inflammatory circle, of a vermilion red colour, which is quickly followed by suppuration, which separates the gangrenous parts. To favour the suppuration, a simple digestive plaster is applied over the inflamed parts. In proportion as the eschars separate, the detached edges are to be cut off, and after the complete casting off of the dead parts, a simple ulcer is left behind. We are speaking of gangrene confined to the skin and cellular tissue; if it affect one or more toes, it should be treated in the same way.

But if gangrene affect a whole limb, we wait until nature forms the line of demarkation, and then amputate above it, if the patient be strong enough to support the operation. If otherwise, we cut off the limb as near as possible to the living parts, and embalm the stump (if I may be allowed the expression) in balsamic remedies. The end of the stump separates like an ulcer, and more easily than the whole limb, the resection of which would be very inconvenient, and would hinder the cicatrix from forming. But experience has taught us, that we may safely leave to nature the separation of the portions of bone, the gestation of which would be very inconvenient, and could not be made near enough to the flesh without wounding it, and with tearing open the tender cicatrix. Moreover, we should not be certain of taking away all the mortified part; and if we must wait until nature separates the rest, the operation will have been useless. The separation of the dead bone will take place after a time; sometimes in two months, sometimes in four, sometimes not till a year. While na-

ture is at work at this operation, the surgeon has nothing to do, but to dress the ulcer, and to support the patient by a proper regimen.

Pott has described a kind of gangrene which resembles that of which we have just spoken, in which he gave opium internally, with great advantage. We shall state, very briefly, what this author says on this subject.

It attacks the lower extremities, sometimes with a slight pain; sometimes without any. But generally the patient experiences, at night especially, a great uneasiness throughout the whole foot and ankle, before the parts show the least symptom of disease.

Commonly it commences with a little black or blueish spot, on the inside or at the end of one or more toes. At this spot we find the cutis always a little detached, and the skin beneath of a deep red colour. It now becomes visible at the upper or lower side of the affected toes. When it reaches the foot, the upper part is first diseased, and becomes swollen, red, and blistered. The disease varies in different persons—sometimes it is slow, and takes considerable time to pass from one toe to another, and thence to the foot and instep; again its progress is rapid and cruelly painful.

Both sexes are subject to this disease; but for one woman whom Pott saw affected, he saw at least twenty men. At first he thought it most frequent among the rich and voluptuous, who eat and drink much more than the poor who work for a living. It often attacks old persons; but it is not peculiar to advanced age. It is not generally preceded or attended by any visible disease of the part, or of the constitution. Pott, however, thinks it mostly attacks those who have had vague pains in the feet, which they have called gouty; and more rarely, those who have decided and regular gout. Some have thought it depending upon an ossification of the vessels; but Pott found this notion to be mere conjecture.

Long experience proved to him, that bark and stimulating topical applications are of no use in this disease. He gave bark in decoction, in extract, and in substance; he combined it with nitre, the carbonat of potash, with snake-root and musk, and always the gangrene went on, perhaps a little more slowly, until the patient died.

But although Pott derived no benefit from the use of bark, his success was complete when he gave opium, which he first did to abate the pain. In this patient the gangrene had made such progress, that at the end of fifteen days the small toes were entirely mortified, and the great toe had become

very black, and the foot much swollen and altered in its colour; the pains were so severe as to produce constant insomnium. Pott gave to this patient at first, two grains of opium, which not having produced the desired effect, he repeated them next day with some benefit. He continued to give two grains morning and evening for three days, at the end of which time the patient was perfectly easy, and the state of the foot and instep was more favourable. Encouraged by this success, he gave a grain every three or four hours, watching its narcotic effect, and regularly opening the bowels by clysters. At the end of nine days from the first use of opium, the swelling of the foot and instep had entirely disappeared; the skin had recovered its natural colour, and all the mortified parts began to separate; at the end of a week, they had fallen off. The pus was healthy, and the granulations red. The use of opium was continued, until the complete separation of the gangrenous parts. As the ulcer discharged, the dose of opium was lessened, until it was entirely omitted.

Pott afterwards gave opium in many similar cases, and he is convinced that this remedy is very efficacious in the kind of mortification of which we speak, and that he has saved many patients by the use of it. He confesses, nevertheless, that it has sometimes failed; but under circumstances which, he thinks, excuse its want of success. He does not propose opium as an universal and infallible specific in this disease, but as a remedy, which has saved many, who would have died under any other treatment.

He very properly disapproves of applying stimulating substances to the part, and advises to wet it with a soothing liquid, such as warm milk, in order to ease the pain which almost always occurs. He also disapproves of scarifications, which some surgeons advise, when the black spot appears, or when the epidermis begins to detach itself. As he has merely in view to sooth and relax, he advises only emollient applications, and recommends leaving to nature the separation of the toes, so as to prevent the irritation which cutting some parts might occasion, when their vital properties were not yet extinct.

Besides the different kinds of gangrene of which we have spoken, there is yet another, which attacks, under certain circumstances, almost all the cases in a hospital; and which has been called the Hospital Sore. But as this affects solutions of continuity, we shall speak of it when treating of the complication of wounds.

CHAPTER IV.

Of Burns.

A Burn is an injury produced by the action of a heated substance upon any part of the living body. It may exist in very different degrees, according to the nature of the heated substance, the quantity of caloric it contained, and the length of time it was applied.

Bodies capable of producing burns, act with greater energy, in proportion as they contain a larger quantity of free caloric; and their capacity for caloric, is, in general, in proportion to their density. Hence, solid dense bodies, such as the metals, heated to a red heat, produce much deeper burns than liquid bodies entirely saturated with caloric. Among these last, simple boiling water burns much less than water holding a saline matter in solution, by which its density is increased. Fat liquids burn more than broth, broth more than milk, and water least of all.

Burns vary according to the continuance of the application of the heated substance. If it remain a long time in contact with a living body, the burn is more deep; if otherwise, it is superficial. Thus, boiling water falling on the hand, produces a more superficial burn than boiling water falling upon the clothes. Burns are generally more superficial, when they affect the parts habitually exposed without covering, because the epidermis is thicker. Thus, persons used to rough work can hold in their hands with impunity a burning coal, which would, upon the slightest contact, burn the hands of others.

There are three degrees of burns, which it is necessary to distinguish, because each requires different treatment.

In the first degree, the effect of the burning body produces only a lively irritation, which attracts the fluids to the part, and a cutaneous inflammation, which resembles erysipelas.

If the burning body act more promptly, it not only irritates, but the irritation is so severe as to produce phlyctænæ, which exposes the nerves of the skin, and a superficial ulcer ensues, like that arising from a blister. This is the second degree.

Lastly, if the burning body act with still more power, and its application be continued for a longer time, it disorganizes the part which it touches; and this part is converted into a crusty eschar: and if the burning body be not

such as to dry it, it changes the eschar to a yellow or grey colour. In both cases the part is dead, and the gangrene is soon surrounded by an inflammatory circle, which announces the efforts of nature to separate it from the living parts.

All burning bodies are not capable of producing the three degrees of burns. The sun for example, produces a cutaneous inflammation of the first degree; but it may produce the second, by detaching the cutis to a greater or less extent. Boiling water, or fatty substances, produces generally the first or second degree; but the application of a hot iron to the skin, converts it into a yellow eschar when it only touches for an instant, and a dry black eschar when it remains only a few seconds. We have the three degrees of burning exemplified, in the use of moxa. If the duration of its application have been very short, the first degree only ensues; if longer, it produces blisters; if longer still, it causes a yellow eschar; if we burn two or three cylinders of cotton on the same place, the eschar becomes dry, black, and crusty.

These three degrees of burns exist separately only in the definition; in nature they are usually combined. The first degree can alone occur without either of the others; the second degree is always accompanied with the first; and the third, with the first and second.

If we consider burns, produced by combustion of the garments, (a frequent accident among women and children,) we see that certain parts, burned to disorganization, show eschars either yellow, or crusty and black; other parts show only small blisters, on the edges of which we see merely a slight degree of erysipelatous inflammation. Thus these three degrees are united in considerable burns.

The phenomena of burns vary according to their degrees. In the first degree, the part is red, slightly swollen, hot, and painful; in the second, blisters filled with yellow serum, are added to these symptoms. They sometimes appear at the moment of the accident; sometimes the day after, sometimes after the expiration of several days. In the third degree, the part presents a gangrenous eschar, sometimes black and crusty, sometimes soft and yellow.

The pain which accompanies a burn, is always very severe: in general it is more intense when the skin has only been burned at its surface, so as to detach the epidermis, than when its organization is destroyed. In very extensive burns, the pain is so violent as to produce convulsions, and even tetanus.

Whatever be the degree of the burn, if it be small in extent, its effects are confined to the part; but when it is very considerable, and especially when it is situated in the abdomen or chest, irritation is communicated to the whole nervous system, fever is brought on, and the disturbance in the animal economy goes so far as to cause death; or if the patient survive the first shock, violent fever comes on, and he dies between the twenty-fifth and fortieth day.

The diagnosis of burns is drawn from different circumstances, and the examination of the parts affected. We judge of the degree of the burn by the phenomena which attend it, by the nature of the burning body, its heat, and the duration of its application.

But it is often difficult to know exactly the extent and depth of a burn, before the inflammation has reached its acme, and the affected parts assume a colour, which leaves no doubt of this disorganization. This usually takes place between the ninth and the twelfth days, and it is this, without doubt, that has given rise to the popular error, that burns continue to extend until the ninth day. This prejudice is unfounded; all the disorder exists from the beginning, but it is often difficult to discover, and this is what surgeons should be aware of, lest they promise what they cannot perform.

The prognosis of burns varies according to the degree and extent of the disease, and the nature of the part affected, and the age and constitution of the patient.

When a burn is slight, it is a disease purely local, a slight inflammation whose symptoms are confined to the affected part, while the health suffers no change; but if the burn be extensive, all the solids become irritated, and fever ensues as in great inflammations. If it be still more extensive—if a limb or a large part of the body be burned, the fever is very violent; it is attended with excessive thirst, and a sense of internal heat. The patient suffers great pain in the burned parts, and dies after some days, sometimes in twenty-four or thirty-six hours. This is what happens to workmen who fall into the ley of soap-makers, into hot solutions of saltpetre, or who are burnt at a fire, &c.

Burns are more dangerous in children than adults; when they affect parts of delicate structure they are worst. A burn of the eye, for example, however slight, endangers its loss. In general they are worst in parts which are habitually exposed, as the hands, neck, face, &c. because, when they are deep, they almost always leave unsightly scars, and sometimes lead to preternatural adhesions, changes in the di-

rection of parts, and the obstruction or obliteration of natural passages. In cachectic persons, and especially those who are scorbutic, a burn, however light, often degenerates into an untractable ulcer: thus we see how important it is in the prognosis to attend to all these circumstances, lest the surgeon be blamed for evils that are inevitable.

There is perhaps no disease whose treatment accords less with theory than burns. They were long treated empirically, and each practitioner boasted of the success of particular remedies; one advised emollients, another astringents and repellents; but the curative indications of burns are to be drawn from the different degrees of the disease.

In the first degree, the fluids are disposed to flow into the parts, to which the irritation attracts them, and inflammation is developed. If we are called at the moment of the accident, we should endeavour to diminish the sensibility, to effect a contraction in the vessels, and thus to prevent the afflux of fluids to the parts. Now the remedy best suited to these indications is the liquid acetate of lead, dissolved in very cold water. This is vulgarly called *vegeto-mineral-water*, or *Goulard's water*; but we should use a larger quantity of the acetate of lead than Goulard did—as for example, two spoonfuls of the extract of saturn to a pint of water, instead of one which he employed. The part is to be plunged into this liquid, (changed frequently) and left there several hours. From the moment of the immersion, the patient feels a striking relief. When the part is taken out of this local bath, it is to be covered with compresses wet with the same liquid, and which should be sprinkled on the compresses from time to time. If the acetate of lead be not at hand, cold water alone may be used.

If the form of the part do not allow it to be dipped into a fluid, we may make ablutions with the same remedy. By these means I have often seen burns of the first degree resolved, before the inflammation could be developed.

If the impression of the heated body have been so deep, that the action of repellents has not kept off inflammation; or if the burn have been badly treated, and inflammation have ensued, we should employ emollients and anodynes in the form of fomentations, or of cataplasms, according to the depth of the injury.

In the second degree of burns, which we have said is accompanied with vesication, it is proper to plunge the part into *vegeto-mineral-water*, or to sprinkle it with this saturine lotion: nothing is more proper to moderate the pain with which this kind of burn is attended, and to prevent the

afflux of fluids, and the inflammatory tension which results from it.

The blisters which rise on the part in this degree of burn, ought not to be opened until after some days, when the irritation has diminished; the least access of air before this period is excessively painful. But when the irritation has subsided, the blisters may be opened without fear, in order to discharge the serum they contain. It ought, indeed, to be done at this time, for the serum remaining too long, would produce ulceration. The blisters should be opened at the inferior parts by simple punctures, so as to admit as little air as possible. We should be particularly careful not to remove the cuticle, or expose the nervous papillæ, the sensibility of which is very acute.

The parts being withdrawn from the vegeto-mineral-water, or the simple water in which they have been immersed, those deprived of cutis, and those upon which blisters have been formed, should be covered with fine linen spread with cerate or some mild ointment, and above this compresses wet with vegeto-mineral-water. When the pain is so acute that the patient cannot bear any dressing, the part is to be constantly covered with liniment composed of equal parts of lime-water and fresh linseed, or olive oil, applied by means of a soft pencil. If much inflammatory swelling affect the parts next those deprived of the cutis, instead of the vegeto-mineral-water, we should apply emollient anodyne fomentations, or poultices of the same nature.

The suppuration which attends the second degree of burns, is more or less abundant, according as the tissue of the skin has suffered more or less from the action of caloric. When the burn has been slight, the parts which have been deprived of their cuticle, may dry without any suppuration, especially if we are careful to prevent the afflux of fluids, by the long-continued use of repellents. But when the surface of the cutis vera has been deeply injured, the suppuration is generally very abundant, and then the dressings ought to be more frequently repeated; it is proper even to make small openings in the plaster of cerate, so that the pus may not be retained in the intervals of dressing. The quantity of pus from an injury of this kind, greatly astonished Fabricius Hildanus, when he treated his servant, who had scalded his leg up to the knee with boiling water. He found, at every dressing, which he repeated twice a-day, more than half a pound of white laudable pus; and this continued several days, although the cutis only was separated, without any deep ulceration, much less sloughing. The cure of this

burn, which produced such an abundant suppuration, was completed in six weeks.

In general, the large and superficial ulcerations produced by the second degree of burns, may be readily cured, by dressing them with simple cerate, or what is better, with that of Goulard; but we ought not to have recourse to this last, until the sensibility of the part is well deadened. I have often been obliged to abandon it, and return to Galen's cerate.

When a burn of the second degree is very extensive, it sometimes excites high inflammation and strong fever. We must then have recourse to bleeding, low diet, diluting drinks, and the other means indicated by the particular symptoms that occur. If the pain be very acute, we ought, besides these means, and the use of soothing anodyne applications, to give opium in doses proportioned to the severity of the pain and the violence of the irritation.

When the burn is caused by the explosion of gunpowder the part becomes black, which might at first lead us to believe the injury much more severe than it really is. Grains of powder are often lodged in the skin; these greatly augment the irritation, and, unless removed, leave indelible marks. In this case, if the burn be on the face, the neck, hands, or the front part of the chest in women, they should be removed with the point of a needle, as soon as possible after the accident. In other respects, these burns require the same treatment as others.

In the third degree of burns, the parts which have been entirely disorganized are to be considered as foreign bodies, of which nature will effect the separation, and to which it is useless to make local applications. But the parts next to them having been burnt to the first or second degree, the treatment must be suited to their state, that is, they are to be plunged in vegeto-mineral-water, and kept there a long time, &c.

Notwithstanding the use of repellents, the third degree of burns is always attended with greater or less inflammatory swelling; and when the burn is extensive, the effects of this inflammation are not confined to the affected part: they go so far as to produce violent fevers, and other dangerous symptoms, which lead to death.

These symptoms are to be combated by refrigerants, low diet, and opium, when their severity requires it; and externally, emollients and anodynes, in the form of fomentations or poultices, according to circumstances. These applications diminish the inflammation, and promote suppura-

tion, by means of which the dead parts are separated from the living. This suppuration arises entirely from the efforts of nature: we can only favour it, by employing mild and relaxing ointments, and by cutting with scissars the ulcers, as soon as they are detached from the living parts beneath. The ulcers resulting from the falling off of the eschars, are to be treated as simple sores. The cure of them is longer and more difficult, when the skin has been destroyed to a great extent, or muscles, tendons, or aponeuroses laid bare. The granulations have a singular tendency to become flabby, and to rise above the level of the skin: hence, in treating them, we should soon abandon the use of ointments, and have recourse to stimulating detergents, in order to excite the action of the parts, and reduce the swelling. When, notwithstanding these means, the granulations become fungous, we should repress them with *argentum nitratum*, or with *alumen ustum*.

The cicatrix of eschars produced by burns being always more or less deformed, we should employ all possible means, when they affect the face, or a part habitually exposed, to render the scar as small as possible.

The first degree of burns leaves no traces of its existence, except a redness, which disappears after a time. In the second degree, if the ulceration of the skin be slight and superficial, and the epidermis is not taken away, the burn heals like a common blister, that is to say, there is very little or no suppuration, and then the marks of the disease quickly disappear. If the surface of the skin be more deeply ulcerated, the cicatrix resembles that of a blister which has suppurated a long time, and is not more deformed than that of a burn of the third degree. The skin and the cellular tissue having been destroyed, it is impossible to prevent the cicatrix from being more or less deep, and adherent to the muscles, tendons, and other parts which have been laid bare: all that can be done in such case, is to repress, with caustic or alum, the more prominent parts of the ulcer, so as to render its surface smooth and uniform. When these means have been neglected, and the cicatrix is more elevated in some places than in others, we may probably diminish the prominent parts, by compressing them with a plate of lead rubbed with quicksilver; or, if they are too hard to be reduced in this way, they may be softened, by rubbing them every day with some mild ointment, or fomenting them with emollient decoctions.

In burns of contiguous parts, as the toes, the fingers, the eye-lashes, &c. we must prevent unnatural adhesions. This

may be done by keeping the parts separated by plasters of cerate, kept on by suitable bandages. When the surface of a natural opening has been deeply burnt, a canula of lead or silver is to be introduced, if the canal be firm and solid, as the nose; plasters or pledgets, if the parts be soft and flaccid, like the lips, or labia pudendi.

Finally, when a burn is situated round a joint, or has deeply affected the fingers, the retraction of the muscles causes the parts to assume an unnatural direction; and if they contract adhesions in this state, not only a very disagreeable deformity is the consequence, but the loss of the functions and motion of the part. This accident, always the result of ignorance or inattention on the part of the surgeon, may be prevented by means of wooden splints, bandages, and other means to obviate the contractions of the muscles, and keep the parts in their natural position. If these means have been neglected, and the burnt parts have contracted proternatural adhesions, or a wrong position; if, for example, in burns of the hand, the fingers have adhered to the back, or the palm, we may, in certain cases, remedy the deformity by an operation, of which we shall speak hereafter.



CHAPTER V.

Of Wounds in general.

A Wound is a solution of continuity, or a division of soft parts, usually bleeding, occasioned by an external cause.

Wounds differ accidentally and essentially.

The accidental differences of wounds arise out of their situation, their extent, their direction, and the cause which has produced them.

In respect to the situation of wounds, we may observe, that all parts of the body are exposed to these injuries; but what we shall say at present, relates to wounds in general, and to those of the extremities in particular. We shall speak of wounds of the head, neck, chest, and abdomen, in that part of the work which treats of diseases in an anatomical order.

In regard to the parts interested, we see wounds which do

not extend beyond the skin or cellular tissue, while others reach the muscles, tendons, large veins, and nerves; the bones themselves are sometimes wounded; and lastly, wounds of the head, chest, and abdomen, may affect the viscera of these cavities.

As to the direction of wounds, it may be considered relatively to the axis of the body, or to the fibres of the organs they affect. Wounds are longitudinal, when they are parallel to the axis of the body; transverse, when they are at right angles to it; and oblique, when between the two.

Wounds are also distinguished into longitudinal, transverse, and oblique, from their relations to the divided fibres. But whatever be the direction of wounds, some present one line of division, others several, which are united at angles more or less acute.

According to the instrument which produces wounds, they are termed incised, punctured, and contused.

The essential distinctions of wounds arise from their simplicity or their complication. A simple wound is one which requires only to be re-united; a complicated wound is one which is connected with some other disease, and to which circumstances are added which require to be treated differently from a simple wound.

A wound may be complicated with its cause, with some effect, or with some disease. When the instrument which has made the wound remains in it, the wound is complicated with its cause: if an imposthume come on, or if there be fracture, the wound is complicated with disease.

We shall first consider simple wounds made with a cutting instrument, next we shall treat of suppurating wounds, and then we shall treat of the complication of wounds in general. Punctured and contused wounds, those made by venomous and by rabid animals, will in their turns be examined.



ARTICLE I.

Of Wounds made with cutting Instruments.

Cutting instruments divide the parts upon which they act, sometimes by pressing a line somewhat in the manner of wedges, and at other times by pressing and sawing at the same time. In the latter case, the solution of continuity takes place more easily, and frequently more deeply; be-

cause then the fibres are elongated, both in the direction in which it presses, and that in which it saws.

In whatever manner the cutting instrument act, the phenomena of the division which it occasions, are, 1st. Effusion of the blood contained in the divided vessels; 2d. Pain arising from the division of nerves; 3d. Separation of the edges of the wound.

Anatomy teaches us, that the blood vessels are so numerous in the human body, that it is impossible to prick the skin, even with the finest needle, without breaking one or more of these vessels. This effect takes place in a much greater degree, when a cutting instrument produces a division of parts.

If the vessels injured be of no great use, the flow of blood is moderate; when they are larger, the effusion is greater. When the flow of blood is so considerable as to be dangerous, it receives the name of hemorrhage. We shall speak of this in considering the complication of wounds: however, when the hemorrhage is so slight as to be arrested by the pressure of the wound proper to produce re-union, it is always considered as simple; such, for example, as that resulting from the operation of the hare-lip.

The experiment which demonstrates the infinite number of sanguineous vessels throughout the body, proves the same of the nervous filaments; for the smallest wound causes pain, and pain can be felt only when there are nerves. But wounds are attended with more or less pain, according to the nature of the instrument which caused them, their extent, the sensibility, and, above all, the anticipation of the patient. A person on whom we are about performing an operation, directs his whole attention to the wound he is to receive, and experiences very great pain. But if we begin without his knowing it, or if he receive a wound in the heat of battle, he is often aware of it only because he sees himself bleeding.

As soon as a part is cut, its edges separate: this arises from several causes, which it is proper to study. The first, is the thickness of the wounding instrument, which, acting like a wedge, must necessarily separate the parts it divides. But this is not the principal cause. The elasticity and the contractibility, either alone or together, chiefly cause the separation of the edges of wounds.

Elasticity is a property common to all animal substances, even after death; but it varies in different parts. Thus, divided skin separates very much, cellular tissue very little, because the former is most elastic. The muscles are

very inelastic, nevertheless their divided edges retract to a great extent; but this is mostly owing to their contractile power, not to their elasticity entirely.

The separation of the edges of wounds arises also from the tension of the part at the moment of its division. Thus, if we cut across the knee of a subject when the leg is bent upon the thigh, we find the skin separating to a much greater extent than if we divide it when the leg is extended.

Contractility or irritability, a peculiar quality of muscular fibres, in virtue of which they tend constantly to shorten themselves, is the most powerful cause of the separation of the edges of a wound in which a muscle is cut across. The separation produced by this cause is much greater if the divided muscle be long, because the contractility of muscles is exactly proportioned to their length.

The force with which the separation is effected, is proportioned to the number of fibres divided, since each fibre may be considered as possessing a given power.

Beside the primitive retraction of a divided muscle, there is another, which is produced by any irritating cause. I have witnessed this phenomenon in living animals. Having laid bare and divided a long muscle, the sartorius for example, I found the separation of its ends, in the first instance greater when the muscle was tense than when it was relaxed during the operation. Again, when I irritated the divided ends with a needle, they began to palpitate, and withdraw farther from each other. The retraction was greatest, when the connection of the muscle with the cellular tissue was divided. In parts which have no contractility, such as the skin, the cellular tissue, the tendons, ligaments, &c. the separation is owing to elasticity altogether; but, in wounds of muscles, contractility and elasticity both act: hence the contraction is greater, as we have said, when they are in the stretch when cut.

The signs of wounds may be divided into commemorative and diagnostic.

The commemorative signs are derived from the circumstances which attended the wound when it was made; as the posture of the wounded person, that of the person or thing which inflicted it, the size and state of the instrument, &c.

The diagnostic signs are sensible and rational. We judge by the sight of the external size of a wound, whether it be accompanied with loss of substance or not; by the touch, either with the finger or a probe, of its direction, depth, &c.; by the smell we perceive an excretion coming from wounds of certain parts.

The senses do not teach us all that is to be learned respecting wounds : reason and anatomy enable us to judge if a nerve have been wounded, by the loss of motion and sensation in the part to which it is distributed ; if a viscus have been injured, by the situation of the wound, the pain and the injury of the functions, the discharge of excrements by the orifice, &c.

The prognosis of wounds made by cutting instruments, varies according to the extent and depth of the incision, the parts which are injured, and other circumstances. Deep and extensive wounds are more dangerous and difficult of cure than those which affect the skin only. When nerves and vessels are injured, the danger is in proportion to their size. Simple wounds, which require only to be closed, are least dangerous of all. We are to consider, in forming a prognosis, the age, temperament, and health of the patient.

A simple wound presents no other curative indication than that of bringing its sides into contact. It may unite by agglutination of its sides, or by suppuration and granulation. The ancients called the former, healing by the first intention ; the other, healing by the second intention.

Simple wounds are to be united, when the instrument has not caused any loss of substance, or when, with loss of substance, the parts are very extensible, as the chest, lips, &c.

In order to the adhesion of divided surfaces, it is essential that they actually bleed, or if inflammation affect them, that healthy suppuration be established, and that they be covered with granulations. It is necessary also, that the two lips of the wound be living, and that circulation be carried on, quite to their surfaces, because they are reciprocally to furnish each other their contingent of vital action, in order to their adhesion. If these conditions do not exist, re-union will be impracticable, or injurious. Thus, for example, it would be useless in a gun-shot wound, of which the sides are bruised, deadened, and disorganized : it would be injurious in a wound which has been neglected, or exposed to the contact of air, and whose edges, being inflamed, furnish only a bloody serum. In this case we must wait for suppuration and granulation. Finally, it is impracticable to re-unite a part entirely separated from the body. It would be useless to replace a flap of skin entirely detached, or the end of a finger cut off.

Nevertheless, there are some facts from which we may infer, that a part entirely separated, and no longer participating in the life of the body, may be re-united. Garregeot relates a case, which, if correct, proves that re-

union is not always to be despaired of. A person bit off all the cartilaginous part of the nose of a soldier, threw it upon the ground, and stamped upon it. The soldier picked up his nose, threw it into an apothecary's shop, and ran to revenge himself on his adversary. This done, he came back; his nose had been washed in the mean time with warm wine: it was put in its place, and retained by sticking plaster. The next day re-union had begun,—on the fourth day it was perfect.* This case has been thought extraordinary, and not altogether credible. But no one has denied, that the spur of a cock may be cut off, and made to adhere, and even grow larger on its comb. John Hunter introduced a cock's testicle into the abdomen of a hen, where it adhered. It was found that anastomoses were established between the vessels of the testicle and those of the hen.†

These facts authorize us to attempt the re-union of parts entirely separated from the body, especially when these parts contain a great quantity of fluids, and are not disposed to putrefaction, such as the nose, the ears, &c.

If it be doubtful, whether close apposition of divided parts be useful, when they are entirely separated, there can be no question of the propriety of it, when there is still a connection, however slight. In fact, however few the vessels of the connecting part may be, the life is nevertheless preserved, and re-union will probably take place. Thus we see the fingers, of which the bones and tendons have been cut, and which remain attached by a small shred of skin, consolidate when the parts are brought accurately together. There are examples of the re-union of limbs, the arm, for example, although the bone and the greater part of the muscles were cut; the lower part being connected only by a small quantity of flesh, in which the brachial artery and nerves were included.

When adhesion is possible, we are to put the lips of the wound in contact, and keep them so, until cicatrization takes place; but previously it is necessary to remove all foreign bodies, coagulated blood, &c. which would hinder the immediate contact of the sides. The means which are employed to unite simple wounds, are, position, bandages, sticking plaster, and suture.

Position consists in putting the wounded part in such a situation that its lips are contiguous to each other. It is

* Garengeot Opus. de Chirurg. tom. iii. p. 85.

† See note D.

proper, whenever the movement of a limb tends to relax, or stretch the divided parts; but it cannot be employed in wounds of the head, eye-brows, nose, ears, the side of ginglymoid articulations, or of the posterior part of the pelvis, &c. But in all other parts of the body, position is a principal means of re-union, and one without which the others would be ineffectual. It varies according to the situation of the wound, and the nature and function of the injured parts.

When the skin alone is divided, the proper position is that in which this membrane is relaxed; if then the wound be situated on the anterior part of the neck, the proper position is a flexed state of the head. This position remedies the separation which results from the elasticity of the skin, and we only employ sticking plaster and bandages, as auxiliary means. But when the wound is longitudinal, that is to say, parallel to the axis of the body, position is the only means which can aid the sticking plaster. When a muscle is wounded, the position must vary according to the direction of the division. If the muscle have been cut entirely across, or only in a part of its thickness, the position ought to be such as the muscle gives the part where it contracts: for example, when the rectus muscle of the thigh is cut across, if we extend the leg upon the thigh, and bend the thigh upon the pelvis, we give the limb the position which is most favourable to the edges of the wound, and this position is precisely that into which the action of the muscle would throw it; but if an extensor muscle be divided, the part is to be extended, and vice versa. Thus by understanding the use of muscles, we can always know the position it is necessary to give the limb, to favour the approximation of the divided parts.

In transverse wounds, position diminishes the separation caused by the elasticity of the divided muscle. The end approaches to a certain extent, but never comes into immediate contact, because position does not remedy the separation produced by muscular contractility; a power always acting, whether the muscle be relaxed or tense. The same thing does not obtain in transverse wounds of the tendons, in which position alone is sufficient to bring into contact the divided ends; because in this sort of wounds the separation arises less from muscular contraction, than the elasticity of the divided tendons. Nevertheless, although position does not produce all the effect we could wish in transverse wounds of muscles, it ought always to be employed. It remedies, as we have before said, the separation produced by elasticity; it relaxes the muscles; and, finally,

it throws the surrounding cellular tissue into such a lax state, that they are readily acted upon by bandages.

In longitudinal wounds of *museles*, the position ought to be the reverse of that produced by the action of the muscle. Thus, if an extended muscle be divided, the position must be flexed, and vice versa.

When the wound is oblique, the part is to be placed midway between the position proper for longitudinal wounds and that for transverse wounds. However, I would recommend a nearer approach to that position which is necessary for parts divided transversely.

It is not sufficient to put the limb in a position which favours the approximation of the lips of the wound, but it is further necessary to keep it so; for the *museles* which are antagonists to those which are divided, might, during sleep; or even through the inadvertency of the patient, contract and produce motions contrary to the end we have in view. It is particularly necessary to employ the means calculated to keep the part in the situation given to it. This precaution is so much the more proper, as the position puts the two ends of the divided tendon in immediate contact. The part is to be kept in the position which favours the re-union of the wound by means of bandages; the construction and application of which, ought to be suited to the structure of the part, and the movements of which it is capable. Among the apparatus of this kind, there are some particularly ingenious; such is the shoe of Petit for the rupture of the *tendo achillis*; such also is the machine described by La Sage, in his notes upon the surgical works of Dionis, intended to keep the hand and fingers extended in transverse wounds of their extensor *museles*. But when we know the uses of the divided muscles and their antagonists, we may substitute for such complicated apparatus very simple contrivances, of which we shall speak hereafter. A surgeon acquainted with anatomy, and the general principles of bandages, however little genius he may have, will readily devise machines, bandages, and apparatus, proper to keep the parts in the most favourable posture for re-union; but whatever means he employs to fulfil this indication, the part is to be kept in a proper position to prevent the action of the muscles, which are antagonists to those that are divided.

The construction of uniting bandages must be suited to the situation and direction of the wound; if it be longitudinal, the following bandages and apparatus are best. Take a bandage whose breadth is only a little greater than the length of the wound, and whose length is sufficient to go

three or four times round the limb ; cut this bandage at one of its ends, to an extent of eighteen inches, into as many strips as it is inches broad, at a distance more or less great, according to the size of the limb ; make in the direction of the length of the bandage, as many slits or button-holes as there are strips at its ends ; these slits are to be three or four inches long. Beside this bandage, we are to take two graduated compresses, as broad as the bandage, and of a thickness proportioned to the depth of the wound.

The bandage is to be applied in the following manner : The limb being put in the proper position, is to be kept there by one of the assistants ; afterwards the middle of that part of the bandage which is comprised between the slips and the end of the strips, is to be placed exactly opposite to the wound, and the bandage is to be drawn towards it on each side ; the strips are now to be passed through the corresponding slits, and are to be held there with one hand, with the rest of the roller ; while with the other hand, the graduated compresses are to be placed on the sides of the wound, at a distance from it proportioned to its depth ; generally the thickest edge of the compress ought to correspond to the extremities of a right line, which would pass through the limb and the bottom of the wound. The bandage is to be tightened, by drawing in opposite directions the strips and the body of the bandage, taking care that there are few or no folds next the slits ; the strips are to be passed round the limb, and to be fastened by circular turns of the bandage, all of which is now to be passed directly round ; two single rollers are also necessary, three fingers broad, and long enough to cover the whole limb. This bandage compresses the lips of the wound against each other. The graduated compresses render the pressure stronger on those parts over which they are placed, and thus equalize the action of the bandage in every part of the wound ; otherwise, the bottom of the wound would not adhere, pus would collect, and the adhesion of the external part would either be prevented or rendered useless.

In transverse wounds, the uniting bandage is to be made as follows. Take two bandages, each as long as the wounded limb, and as broad as the wound is long. Divide one into as many slips as the wound is inches long, throughout half or one-third its extent ; the other is to be split longitudinally, into as many heads as there are holes in the former.

The limb being conveniently placed and retained by two assistants, the slip bandage is to be applied so that the slits correspond to the wound, and that the lower part of it ex-

tends below the lower articulation of the limb; this may be fastened by three turns. A part of the bandage is now to be passed round the other way, and fastened as before. This bandage is to be further secured by circular turns from above downward, which are to extend quite to the wound; the roller is now to be given to an assistant, while the split bandage is placed on the upper part of the limb, with its slits three or four inches above the wound. Its upper end is to be fixed in the same way as the first bandage, by circular turns of the roller continued down to the wound; the strips of the upper bandage are now to be passed into the slits of the inferior bandage, while they are drawn in opposite directions until the edges of the wound are brought into contact; the strips of the upper bandage are then to be placed on the lower part of the limb, and to be kept there by continued turns of the upper roller; in the same way the upper extremity of the lower bandage is to be fastened by the inferior roller. No graduated compresses are to be used, because they do not tend to bring together the bottom of the wound; but a roller must be applied over all the rest of the limb, to prevent the swelling, to which pressure on the nerves and lymphatic vessels would otherwise give rise. The uniting bandage ought not to be drawn tighter than is necessary to keep the lips of the wound in contact; and it ought especially to be drawn uniformly tight, lest it should cause swelling in parts less compressed, which would retard the cure, by obliging us to remove the apparatus before the entire re-union of the lips of the wound.

The uniting bandage has a very marked effect in transverse wounds of the skin, the sides of which separate only by reason of the elasticity of this membrane; but not so in transverse wounds of the muscles, over which this bandage has little control. Endowed with a contractile power, which is always acting, the two ends of a divided muscle escape the pressure of the bandage, because it acts perpendicularly, or almost perpendicularly, to the direction in which the contraction takes place. Nevertheless, transverse wounds of the muscles, treated by position and bandage, do cicatrize; but their cicatrization is effected through the medium of cellular substance, which fills the intervals of the divided ends of a muscle, and which hardens in time, becoming a kind of tendinous substance. This does not injure the action of the muscle, provided it be not very broad; and when the fibres of the muscles are pretty long, their motion is hardly at all effected; but when the wound has been badly united, and especially if it have separated, and the uniting cellular substance is

very broad, and the divided muscular fibres very short, their retraction is not great enough for the parts upon which these muscles act for them to enjoy their former extent of motion. Hence their movements are limited, and sometimes lost. In this case we might re-establish the motions, by opening the wound, cutting out the cicatrix, and employing the most efficacious means of re-union. This is proved by the following case.

M. Achilles de Coulonges, a dragoon, aged twenty years, received a sabre-cut on the external and middle part of the fore-arm, which divided the posterior cubital muscle, and so much of the common extensor of the fingers as goes to the ring and little finger. The transverse wound which resulted, suppurated a long time; when it had been healed six months, the hand was bent and inclined toward the cubital edge of the fore-arm; so that the two last fingers were also bent; voluntary extension of these parts was impossible, and the flexion of the two last fingers was not strong enough for M. C. to raise a body of middling size, and to hold it firmly in his hand.*

M. C. came to Paris and consulted several surgeons, who advised dry-cupping with factitious hydro-sulphurated water; a remedy which could have no effect. M. Dutertre, a surgeon of Paris, under whose care M. C. had put himself, determined to remove the cicatrix, and to unite this new wound with the uniting bandage, and particularly by a machine for graduating at pleasure, and by very slow degrees, the extension of the hand and fingers. The operation was performed the 28th of August, 1804, and succeeded perfectly. M. C. whom I saw before and after the operation, recovered the use of his hand and fingers, and continued the favourite profession, into which he had voluntarily entered. For more ample details of this interesting case, the reader may consult the Inaugural Thesis of M. Dutertre, defended at the School of Medicine of Paris, the 11th of May, of the year 1805. We think this surgeon might have dispensed with the sutures, and if they did no harm, it was by the precautions he took to extend the hand and fingers as much as possible.

Sticking plasters readily adhere to parts to which they are

* When the extensor muscles of the hand have lost their action, and this part is acted upon by its own weight, or the contraction of the flexor muscles, the hand cannot be opened to grasp any thing: this is what occurs after the radial nerve is cut. If, in this case, we open the hand, it is capable of contracting with as much force as before the accident. The use of the hand may be restored by a machine to keep it open, and which at the same time yields, when the flexor muscles are voluntarily contracted.

applied, and may be very effectual in keeping the edges of a wound in contact; but as they act only on the skin, it follows that they can be useful only in wounds of the integuments, and of parts which adhere to them, as the eyelashes, forehead, &c. in which position has no effect. If they were used in wounds of muscles which are connected with the skin only by loose cellular substance, the external part of the wound alone would unite; the bottom would form a cavity in which fluids would collect, and cause a re-opening and suppuration of the wound.

Sticking plasters are made of different substances, as the plaster of diacholon cum gummis, and that of Andrew de la Croix, of tripharmichum, &c.* Some use court-plaster made with isinglass and a balsam. This is the best sticking plaster in small superficial wounds, especially in persons of delicate skins, because it is not liable to produce erysipelatous pimples, like other sticking plaster; but is only to be had in small pieces; and when long slips are wanted, we must use a plaster of diacholon, or that of Andrew de la Croix.

The length, the breadth, and form of the sticking plaster, must be regulated by the situation, depth, and figure of the wound. As these plasters act with more force when they adhere to a large surface, their length must be proportioned to the force we wish to apply to them. When the wound is small, and its lips not much separated, a single piece is sufficient. After the skin is wiped dry and the wound closed, it is to be applied at once to both its sides.

When the wound is considerable, and the lips flabby and very moveable, we should employ several sticking plasters. The number, the length, and the breadth of each slip must be proportioned to the length and the depth of the wound, and the extent of the separation of its sides.

One of the strips is to be laid on one side of the wound, whose lips being adjusted, the remainder of the strip is to be laid on the other side, and so of each strip. When the wound has a flap or angle, the first strip of plaster should correspond to the apex of the flap. In other cases it should be placed over the part where the separation is greatest. After all the strips are applied, if any one be loose, it is to be raised on one side only, and perfectly adjusted. These strips have the advantage of being capable of being tightened at pleasure; the spaces between them facilitate the discharge of pus, when the wound tends to suppuration from slight contusion. They may be removed or applied separately.

* See note E.

Whatever be the form of the sticking plasters, when they are changed or removed altogether, one of the ends is to be first raised by drawing it towards the wound gently until very near it, while the finger is pressed against the skin, so as to prevent them from tearing the new adhesions. The other end is to be removed with the same precautions. The remainder is to be detached by drawing it parallel to the length of the wound; for if it were drawn side-ways, we should run the risk of tearing open the tender cicatrix.

Formerly sutures were considered the only means of uniting solutions of continuity, and such was the prejudice in their favour, that the bad consequences resulting from them were attributed to other sources; such as the size of the wound, the bad constitution of the patient, &c. The progress of modern surgery has thrown great light upon this subject; and French surgeons deserve the credit of having effected the improvements in this branch of the healing art.

Pibrac and Louis have exposed in so clear and luminous a manner, the inconvenience and inutility of the suture, in a great number of cases in which they were thought necessary; that we should omit this subject, if works had not appeared since the publication of the *Memoirs of the Royal Academy of Surgery*, in which the suture is regarded as one of the most common and useful operations of surgery; and if surgeons far behind the improvements of a former century, did not still obstinately continue to sew up wounds which might be easily healed by the most simple means.

To judge of the utility of stitches, we should consider their effects. If we use them in a wound which has divided the skin only, the introduction of the needle causes acute pain, and the threads are a constant source of irritation. The holes through which the ligature is passed inflame, suppurate, enlarge, and become suppurating wounds which may have a long duration. These, it is true, are trivial circumstances; but they are sufficient to lead us to proscribe the suture, in cases where more simple means are equally effectual.

If a suture be applied to a divided muscle, it is irritated, and constantly retracts, absolutely defeating its own object. Involuntary contraction of the divided portions is the more to be dreaded, as the cause which produces it is continually acting.

The ordinary effect of this retraction is to tear the parts included in the sutures. This especially takes place when the muscle is strong, and the sutures numerous. The threads

do not tear the parts in the manner of ligatures which are gradually tightened, but because these parts, gradually swelling, become too large for the threads, and particularly because the retraction of the ends of the muscle presses them against the suture, which severs them in the same manner as the blade of an instrument, held firm and immoveable, would divide a part when forcibly pressed against its edge.

These inconveniences, almost inseparable from sutures, have led some persons to abandon them entirely. But in some cases they are indispensable; as when, for example, it is impossible to unite a wound by position, bandages, and plasters, and from a want of a re-union, or an inexact re-union, greater inconveniences would result than from the use of the suture.

The wounds which present these conditions are, 1st. Those which divide the lips throughout their whole thickness, and to a great extent, whether the wound be incised or contused, whether it result from the operation for hare-lip or the extirpation of a cancerous tumour. 2d. Large wounds, penetrating into the abdomen. 3d. Wounds of the intestines. In treating of these wounds, we shall state the motives which lead us to employ suture for their re-union, and we shall point out the precautions necessary to ensure success.

When put into direct contact, the lips of a wound adhere, and the white organized vascular substance which consolidates them, is called a cicatrix.

There are cases where wounds would unite, if we could bring them together, even when a loss of substance has taken place to some extent; so also there are other cases, when, though put into exact apposition, the sides of a wound will not adhere, as in gun-shot wounds for example, or incised wounds which have been left open for some time. In such cases we must wait for suppuration and granulation.

We are entirely ignorant of the mechanism by which nature consolidates wounds. Some authors have attributed it to the interposition and the drying of a glutinous fluid, which exudes from the divided parts, and which identifies them; but, were it so, the exuded fluid would form an inorganic substance, and the circulation would no longer take place between the lips of the wound. Now it is demonstrable, that cicatrices are organic, vascular, and permeable to fluids; they cannot then be formed of inorganic substances. The healing of wounds by the first intention has been explained in another manner. It has been said that the patulous mouths of the vessels of one side open directly into corresponding vessels on the other side, so that the con-

tinuity of these vessels is re-established, and the circulation takes place as before. But the mechanism by which the sides of the vessels unite is not explained; beside, how can we conceive that a thousand open vessels on one side can correspond exactly to as great a number on the other? The thing appears impossible; and, moreover, it is certain that this exact correspondence is by no means necessary to adhesion, for we see a wound unite whose lips are by no means accurately adjusted. We are, in fact, perfectly ignorant of the mode in which adhesion takes place; all we know is, that a certain degree of inflammation is necessary to this process: either too little or too much may serve to prevent it.

Adhesion always takes place more readily in young than in old persons. In infants, simple wounds are generally healed in three days, if properly dressed, as we observe in the operation for hare-lip. In an infant of eight months I procured, in three days, the adhesion of the stump of a sixth finger, which was amputated. In middle-aged persons adhesion may also take place very soon, as in four or five days. In old and cachectic persons, nature proceeds more slowly.

Formerly balsamics and vulneraries were employed to consolidate wounds. The inutility of these means is now universally acknowledged, and at present nothing more is done than to wash from the wound every thing that can prevent the immediate contact of its sides, to hinder the access of air, and remove every thing that might create inflammation. When a wound is large, low diet and venesection, once or oftener, are required, according to the magnitude of the wound, the age and temperament of the patient. Without these precautions, too much inflammation would come on, and suppuration would follow.

We have said, that cicatrices were organized. This is proved by the following fact: Make on the head of an animal, a dog for instance, two incisions which meet at an acute angle, detach the flap a little beyond the other ends of the first incision; replace it, and retain it with sticking plaster: it will be united in four or five days. Now make two other incisions from the ends of the former, which in like manner meet at an acute angle, dissect another flap, and replace it as before: it will be seen that the diamond-like space comprehended between the four incisions has been entirely detached by the two operations, and of course it can communicate with the other parts of the animal only through the cicatrices—a complete proof that they are vascular.

Cicatricees are at first red, inclining to violet. In time the substances that form them contract, and assume a white colour, different from that of the skin. If the lips of the wound be put exactly in the same line, and accurately adjusted, the cicatrix forms a straight line, hard and visible ; if, on the other hand, they remain at a distance from each other, it is more or less broad, projecting, and deformed. We should endeavour to prevent this deformity, especially if the wound be in the face, or a part habitually exposed.

ARTICLE II.

Of Simple Wounds, which heal by Suppuration.

When a wound is attended with loss of substance, or when without loss of substance it has not been brought together, or having been brought together, has not, from particular circumstances, united, the following phenomena take place.

The effusion of blood gradually diminishes, and stops of itself, or is arrested by the most simple means ; the pain, which was at first acute, abates by degrees, and ceases in a few hours ; to the flow of blood succeeds a bloody serous effusion, which soon becomes entirely serous, and ceases in two or three days ; the wound is then dry ; on its lips there is some inflammation ; suppuration necessarily succeeds it ; a new serous effusion first takes place ; the surface of the wound is then blue, sometimes even livid, and of a disagreeable appearance ; it secretes sanious pus a little bloody ; gradually the discharge acquires consistence and a yellowish-white colour, and changes to laudable pus ; at the same time the surface of the wound becomes regular, and is covered with a great number of small red conical tubercles, which are called granulations : the wound goes on discharging, and diminishes in breadth and depth ; its edge is covered with a red pellicle, which gradually extends towards the centre : this pellicle is the cicatrix ; when it covers the whole surface of the wound, it is then healed. We shall speak particularly of each of these phenomena, and give them the best explanation we can.

The effusion of blood which we observe in almost all recent wounds, as we have remarked, does not continue long ; in fact, the orifices of the numerous vessels which have been divided, being irritated by the contact of air, and by the lint with which the wound is covered, contract and

packer up to such a degree as to prevent the farther escape of blood, and permit the passage of bloody serum only, which also ceases when inflammation commences.

The pain which attends wounds in the beginning, abates gradually, and ceases almost in seven or eight hours; and this in cases even of the largest wounds, as amputation of a limb, or extirpation of a cancerous breast. Inflammation takes place on the sides of a wound in two or three days: it is the result of the irritation produced by the division of nervous filaments, and by the dressings. This irritation draws the fluids to the part, and augments the vital action of the fluids. The inflammation is proportioned to the sensibility of the patient, the extent of the wound, and the manner in which it has been dressed: it is least when the wound has not been exposed to the air, and has been dressed with emollients, and when no active applications have been made to it. When the wound is considerable, the inflammation, which supervenes in a few days after the injury, is attended with fever. This is called suppurative fever, and diminishes as suppuration takes place. It is generally proportioned to the extent of the wound; but sometimes, even in large wounds, it is scarcely perceptible.

Suppuration is a necessary consequence of inflammation. It takes place in wounds by the same laws, and by the same mechanism, as in tumours which form abscesses. The only difference is, that the surface of the wound being open, the pus flows out. But inflammation of wounds terminates also in part by resolution. Suppuration takes place only on the surface; the inflammation of the adjacent parts terminates by resolution.

The purulent matter of a wound beginning to suppurate, is, as we have said, more or less sanious. It is, in fact, bloody pus, like that which forms in boils. The inflammation is then too high to produce healthy pus. As it diminishes, the pus grows better. The wound becomes clean, and is covered with vermillion coloured granulations. There is a constant relation between the granulations and the discharge. When the granulations are of a bright red, not too large, nor too much inflamed, the pus is of a yellowish-white colour, of the consistence of cream; but as soon as the state of the wound changes, the discharge also is altered. Thus, if the inflammation increase to an improper degree, the pus becomes bloody; if on the other hand, it sinks too low, the granulations become pale and soft, pushed up, and in a manner edematous, the pus becomes serous and abundant.

By watching attentively the progress of a suppurating wound, we see its depth and breadth diminish daily, while, at the same time, pus is secreted in smaller quantity. This constantly takes place when there is the degree of inflammation proper for the formation of laudable pus; but the moment this ceases to be the case, the wound becomes retrograde, and enlarges instead of diminishing. The gradual diminution of a suppurating wound, is one of the most remarkable phenomena of this kind of solution of continuity, and merits attentive consideration.

It was long believed that the cure of wounds, attended with loss of substance, was accompanied with a regeneration of flesh, sufficient to re-place the part destroyed, and form the substance of a cicatrix.

Authors have explained differently the mechanism of this regeneration.* Some have imagined that the flesh was reproduced by the application of a nourishing juice to the extremities of the small divided vessels. They supposed that small drops of this juice, having reached the extremity of each divided vessel, adhered, and hardened into flesh; that a second drop adhered to the first, and so on, until the whole cavity was filled up. Thus the work of nature, in filling up wounds, has been compared to that of a man, who builds a chimney, by placing successive strata of bricks on its circumference.

This clumsy explanation, borrowed from masonry, was found little conformable to the laws of nature. It was believed that the portion of divided vessels could not be repaired by the nourishing juice furnished by the vessels themselves. It was conceived that the hardened particles of this fluid being applied to one another, would only form an inorganic matter, instead of a vascular tissue, like that which grows over wounds and ulcers.

This mode of reasoning led to the rejection of this hypothesis, and then it was thought that parts were regenerated by the dilatation of the smallest vessels, or by the extension of a flexible delicate tissue, which grows by the impulse of the fluids alone, and afterwards changes to a white uniform substance, more or less solid.

The doctrine of the regeneration of flesh was admitted indiscriminately by all authors, until Fabre, in the year 1752, read to the Royal Academy of Surgery, a memoir, in which he demonstrates, by reasoning and experiment, that nature follows a course very different from what was imagined in the

* Garengeot *Traité des Operations*

healing of wounds, attended with loss of substance. The facts upon which Fabre grounds his opinion appeared decisive. But as his doctrine overthrew all the then received opinions on this subject, it was not until five years of differences and discussions, which were renewed at almost every sitting of the Academy, that it finally triumphed, and was stamped with the approbation of that celebrated body. The following are the reasons which led Fabre, and all subsequent surgeons, to reject the doctrine of the regeneration of flesh.

In wounds, with loss of substance, the parts which have been removed, are not regenerated. It is incontestable that the sensible vessels, the nerves, the tendons, &c. are never renewed. We never find these parts in the substance of a cicatrix. Neither are the muscular fibres regenerated. We may convince ourselves of this by dissecting the cicatrices of wounds attended with loss of muscular substance: not only the substance of such cicatrices is not muscular, but we see each extremity of the muscle is drawn up and sunk, so that there remains at the place where the wound was made, a distention proportioned to the loss of muscular substance. If this loss of substance extend quite down to a bone, the hollow appears deeper and deeper as the person becomes fatter, because the surrounding parts become filled with fluids, and raised from the depression they discovered during the cure; but the centre of the cicatrix is kept down by the bone to which it adheres. These phenomena would not take place, if the wound were filled with a new substance.

In the next place, if parts were regenerated, how could a wound close up? We can well conceive how the bottom of the wound could fill up to a level with adjacent parts; but how can it make the wound narrower? On the contrary, its breadth would remain proportioned to the loss of substance. But, in fact, the cicatrix is always much less than the original wound.

When a wound is almost healed, and a small surface only remains to be cicatrized, if the patient commit an error in diet or regimen, so as to bring on fever, in twenty-four hours the wound will have become almost as large as ever. Now, if the cicatrix, which was almost complete before this accident, were formed by a renewal of parts, what has become of the regenerated substance?

The partisans of regeneration have brought forward a crowd of specious objections, to which it is easy to reply. These objections have turned chiefly on the granulations on the surface of a wound; some cases have been adduced, in which the cavity of an ulcer has filled up without any depres-

sion. Examples too are mentioned, of parts that have been regenerated; of ulcers whose cavities have filled the extension of the tissue of the surrounding parts; of the thickness which certain membranes contract and retain when they have suppurated; of the reparation of bones in certain instances.

Granulations have been taken for a vegetation, a new substance, the product of regeneration; but they are only cellular tissue, and the natural vessels of the former substance of the part, modified by swelling and inflammation. Thus we see them the same in all parts of the body, and for this reason, that the cellular and vascular tissue is every where alike. Granulations from bones are exactly the same as those from soft parts; the closest inspection of granulations discovers no fibres; we see only a uniform soft substance, almost entirely vascular, and bleeding on the slightest touch. It is certain then that granulations are not produced by regeneration, and that they are the result of a congestion and inflammation of the vascular tissue of the substances pre-existing in the part. It is certain also, that the degree of inflammation in these tubercles regulates the quality of pus, and the progress of the wound towards a cure. We shall presently notice the practical deductions arising from this truth.

The objection grounded upon the healing of certain ulcers without depression of their sides, has no foundation; for the cure of these ulcers depends upon the immediate adhesion of their sides, without any interposed regenerated substance. Daily experience teaches us that the sides of an ulcer which constantly touch each other, unite by adhesion, though the part may have sustained a great loss of substance. But when the structure of the part does not allow this contact of the sides, and, moreover, renders expulsive compression impossible, the ulcer does not heal, but becomes fistulous, unless the fattening of the patient bring its sides together, by giving to the parts their natural size. We shall speak particularly of this case hereafter.

It has been farther objected to the doctrine of the non-regeneration of parts, that a ball may pass through the fleshy part of the thigh, not touching the large vessels or nerves, and after the wound is healed, only a slight depression shall appear at the place of the entrance and exit of the ball. "The parts would not thus unite," it is urged, "if regeneration did not take place; and, far from finding that the openings made by the ball disappeared or closed, they would necessarily enlarge by the retraction of the muscu-

“lar fibres, and an oval canal would remain. Now it is
 “certain that the canal is obliterated; and it is equally true
 “that the fleshy fibres which have been cut, have elongated
 “towards each other, and have vegetated; in a word, they have
 “filled up the space by a regeneration of parts.” But it is easy
 to conceive and to explain the cure of the supposed wound
 without this pretended regeneration. The round form which
 it first presents soon becomes elliptical, by the depression of
 muscular fibres which have been divided. The sides of the
 ellipsis continue to approach each other as the muscles sink,
 and the parts between the course of the ball and the surface
 of the limb move from the circumference towards its centre.
 The sides of the ellipsis soon touch through the whole ex-
 tent of the wound; and this contact, which art is sometimes
 obliged to favour by suitable compression, leads to the ad-
 hesion of the contiguous granulations of the opposite sides of
 the wound. The process of nature is then the same in this
 case as in large ulcers, of which we have treated before.

As to the objections founded on cases in which it has been
 believed parts were entirely renovated, if they seem at first
 sight unanswerable proofs of regeneration, we are soon
 struck with the false consequences which have been de-
 duced from them by persons prejudiced and deceived by
 appearances.

Among the facts of this kind, a case has been cited by
 Mr. Jamieson, in the *Essays of the Society of Edinburgh*.
 A young man, during the existence of a gonorrhœa, was
 seized with an enormous swelling of the penis, for which he
 consulted Mr. Jamieson, who finding this part of prodigious
 size, and the gland and the prepuce already gangrenous,
 immediately made scarifications, and employed the remedies
 he thought best; but in two or three days, notwithstanding
 these means, the penis appearing gangrenous, he resolved
 to amputate the prepuce, the glans, and the end of the cor-
 pus cavernosum. The sixth day after the operation, Mr.
 Jamieson perceived, as he removed the dressings, a fleshy
 eminence of considerable size, which he took for fungus.
 He had to keep it down by repeated applications of lapis
 infernalis and red precipitate; but the severe pain caused
 by these applications, and the fever they excited, obliged
 him to desist, and to dress the sore with dry lint. Never-
 theless, this supposed fungus, which continued growing di-
 rectly out, began on the seventh day to be covered with a
 fine skin, and at length assumed the figure of a well-formed
 and well-proportioned gland, with this exception only, that
 the orifice of the urethra was a little longer than natural.

How could such a case deceive a surgeon! Is it not evident that the appearances deceived Mr. Jamieson; that he amputated the prepuce only, when he thought he had removed the glans itself? The glans was buried among the gangrenous parts, and became visible when they sloughed off.

It would, I think, be useless to cite other cases of parts said to have been completely regenerated: I shall only observe, that all the facts of this kind that are found in authors, relate to parts whose soft, cellular, and vascular structure renders them susceptible of considerable congestion, which, while they were thought to be entirely destroyed by gangrene, were, in fact, gangrenous only in a small part.

The thickening of membranes that have been exposed and covered with granulations, has also been urged as a proof of the regeneration of parts. It is known that the dura mater, when laid bare in the operation of trepanning, becomes very thick, and acquires a cartilaginous, and sometimes even a bony hardness; other membranes, such as the pleura, peritonæum, &c. thicken also, when they have been exposed and have suppurated. But it is clear that this thickening is quite different from a regeneration of parts; it depends altogether upon the engorgement of the vessels which enter into the structure of the membranes, and the infiltration of lymph into the cells of the cellular tissue, of which they are composed.

Finally, it has been urged in favour of the renewal of parts, that a new bone forms in necrosis. But there is no similarity between these bony productions and the regeneration of flesh. In necrosis, the periosteum ossifies, by receiving the nourishing fluids and the phosphate of lime, which were destined to form that portion of bone which was deprived of life; it is not a true regeneration, but a conversion of membrane into bone.

It is certain then, that the cure of wounds with loss of substance is not effected by a regeneration of parts. It is further certain, that such a regeneration would be an obstacle to the healing of a wound; but there is one proof that may be added to the others, sufficient of itself to remove all doubts upon this subject. If the extension of vessels and the reproduction of parts were not carried so far as to separate the lips of the wound and to increase it, they would absolutely counteract the sinking of the parts, without which a wound can never consolidate. Thus we see, after an abuse of relaxing applications, that the granulations become puffed up, and healing cannot go on until they are repressed.

But since reproduction of parts does not take place, what is the mechanism of the healing of suppurating wounds, whether attended with loss of substance or not? This is what we observe in such cases:—

A few days after the wound has been made, and in the acmé of inflammation, if suppuration be about to come on, it appears larger and deeper than it really is; and when there is loss of substance, its surface is greater than the part which has been removed, because the swelling separates its lips, and their engorgement and thickening augment its depth. But suppuration takes place, and reduces the swelling; the edges diminish in thickness, sink, and approximate to the bottom of the wound, of which the depth and breadth diminish in proportion to the quantity of pus discharged. The emaciation which always follows considerable wounds, and which is produced by diet and evacuations, contribute also to their cure, by favouring the sinking of the parts generally, and in particular an elongation of the skin, by reason of the discharge of fluids from the parts beneath. At length, when the discharge and the sinking of the lips of a wound are carried to a certain extent, a thin pellicle forms at its circumference, approaches the centre, and finally covers the wound. Now it is evident, from these phenomena alone, that wounds become smaller by the sinking of parts alone; and as the skin is extensible, and capable of following the motion of other parts to which it is attached, it is drawn towards the centre, without, however, as might be imagined, increasing at all its own dimensions. This last fact is proved by the following experiment, which establishes also the reality of the sinking of which I have spoken.

At a given distance from the edge of a large wound, make in the skin an indelible mark, or one which will last a long time, with the nitrate of silver, for example; then measure the space comprised between this mark and the circumference of the wound, and also the distance from the mark to the centre of the wound. Let this wound go on healing, and in fifteen days measure again the distances as before; we shall find the distance from the mark to the edge of the wound exactly the same, while that between the mark and the centre is considerably diminished. The skin then has advanced by the sinking of the borders of the wound, and this sinking has produced the diminution in breadth and depth. The bottom of the wound does not then rise, but its edges sink: hence the depression of the cicatrix is always proportioned to the loss of substance that has been

sustained, and always exists when the cicatrix is situated over a bone, to which it adheres.

The diminution of wounds goes on very rapidly during the first days, and afterwards becomes very slow. This is the reason of it: The abundant suppuration which takes place during the first fifteen days, produces a speedy sinking of the sides of the wound, swollen by inflammation: hence results a proportional diminution of the size of the wound. Afterwards the suppuration becomes more sparing, and the sinking goes on more slowly, and very soon the sore grows less only by insensible degrees. For this reason, whatever promotes suppuration accelerates the healing of the wound: hence we observe that wounds heal by far the most rapidly in fat persons. In them the cells of the cellular tissue being filled with a large quantity of fluids, which drain off by suppuration and emaciation, a greater sinking takes place than in lean persons, in whom the cells of the cellular tissue are naturally almost empty. For the same reason, wounds in parts of the body where there is abundance of cellular tissue, heal more quickly than those where there is skin only, or very thin muscles.

The size of a wound diminishes, as we have said, because the parts sink from the discharge of pus, and because the skin approaches from the circumference to the centre. It is, however, to be remarked, that the cicatrix begins to form long before the wound ceases to contract, by the discharge and sinking of the parts, and that, therefore, there is a period in wounds, in which their size diminishes by the discharge, and by cicatrization and desiccation at the same time.

Cicatrization always begins at the circumference, and proceeds towards the centre. But when the wound is very large and superficial, several points of cicatrization are formed, resembling little islands. These points multiply and extend until they unite in the same way as the flat bones. We may compare the desiccation of a wound, in this case, to that of a piece of land which has been overflowed; if the water be contained in a deep hollow, the desiccation takes place from the circumference towards the centre; but if a large extent of uneven ground be covered, the desiccation takes place in several elevated points, and at length reaches the intervals that separate them.

The cicatrix is formed by the drying of the extremities of the vessels which have been drained by suppuration, and also by the drying of the cellular tissue. But this cicatrix can only be rendered firm by a nourishing juice, which glues together the drained parts, and which acquires, by time,

sufficient solidity to resist the efforts which might tend to separate what it has united. This juice is found in every part of the body. The blood appears to furnish it for the re-union of recent wounds, whose sides are in exact apposition. But in suppurating wounds it succeeds the flow of pus, and, as it were, solders the parts together.

At first the cicatrix is only a thin pellicle, which yields to the slightest force, but afterwards it becomes thicker and more consistent, and, in proportion to the drying of the parts, becomes more complete, and extends more deeply by the evaporation of moisture, which penetrates the cicatrix itself.

If we examine a cicatrix shortly after a wound is healed, we find it more or less depressed, according to the loss of substance which has taken place. But if this cicatrix cover parts capable of extension and increase of size by nutrition, the depression may diminish, and, in time, even disappear. Suppose, for instance, a portion of muscle to be destroyed, the cicatrix which forms, is at first depressed in proportion to the loss sustained. But if there be much cellular substance under this muscle, an increase of fatness will gradually bring it to a level with the other parts. However, the cicatrix which adheres to a bone that has exfoliated, never raises, and the depression becomes more sensible as the person becomes fatter. The reddish colour of a cicatrix gradually disappears, and in time it becomes a little whiter than the skin, forming a mark which lasts for life.

Such is the process of nature in the cure of simple suppurating wounds, with, or without loss of substance. We shall consider the rules that are deducible from a knowledge of the process of suppuration, for the treatment of this kind of wounds.

The first indication is to prevent the contact of air, the impression of which causes pain, and too great inflammation. For this purpose we employ soft porous substances, calculated to soak up the blood and serum which flows from the wound, without causing too much irritation. Dry lint seems best to answer these purposes. The wound should be covered with it, and this is to be done gently, without cramming or forcing it in; pressure would be painful, and would increase the inflammation. It is useless to add any thing to the lint; irritating substances would be injurious; the alum water employed by Le Dran, with a view to corrugate the small vessels, stings the surface of the wound, and causes pain. Powdered resin, in which

some persons roll the lint, is of no utility, and has the inconvenience of incorporating with the serum, and forming a mass which painfully compresses the wound. Moreover, these means will not arrest any considerable hemorrhagy, and dry lint will suffice to stop a small flow of blood.

The wound being covered with lint, it is to be retained by a compress, and simple bandage. The patient, and the wounded part, are then to be placed in a convenient position, and suitable remedies and regimen are to be prescribed.

When the wound is small, and confined to an unimportant external part, it is sufficient to diminish the quantity of the patient's food, and to give him some diluting drink. But if the wound be very large, or if it affect a very sensible part, the patient must be put upon very spare diet, that is to say, he must take no aliment other than a diluting drink.

Immediately after the application of the apparatus the patient experiences more or less pain, according to the size of the wound. As this pain is inseparable from the wound, and must continue eight or ten hours, we should exhort the patient to bear it with fortitude, and when it is severe we may sooth it with narcotics.

On the second or third day, the wound inflames, and its edges swell. Then a new kind of pain succeeds the first. It is attended with tension and twitching; it is of a peculiar kind, and announces the approach of suppuration. If this inflammation, necessary to the establishment of suppuration, become too great, we must combat it by the means we shall point out when we treat of the complications of wounds.

We must continue the severe regimen on which the patient has been put, for seven or eight days, that is, until the inflammation has subsided, and suppuration is established. We may then prescribe nourishing broths. When suppuration has drained the parts, and the wound is healing, the patient may use, at first strong soups, afterwards solid food, taking a quarter, afterwards an half of what he consumed when in good health. But we must always guard against giving too much, because the swelling of the sides of the wound would oppose the process of nature for its cure.

In the choice of food for the patient, we must consider his temperament, age, and habits, as well as the climate and season of the year. We should avoid every thing that is heating, solid, or aromatic, from their tendency to increase the action of the solids. The patient must not drink much wine, and not any unless mixed with water.

The patient should breathe, as far as possible, a serene

air, free from putrid exhalations, and have it often renewed : the most favourable is that which is dry and moderately warm. Motion, and especially of the affected part, must be interdicted. The patient must rigidly abstain from the pleasure of love, which excites such strong commotions in the nervous system, as in some instances have proved fatal : for this reason we must forbid the use of all food that could excite the venereal appetite, and keep him aloof from women and lascivious objects. A lively turn of mind should be encouraged ; but we must carefully avoid exciting joy, sadness, or anger. The bowels should be kept open by injections and suitable laxatives ; but purgatives are injurious, unless called for by saburra in the primæ viæ, which often happens in hospitals, or by a relaxed phlegmatic habit.

When the inflammation has terminated, and suppuration is well established, diluents are to be discontinued. Bitter and slightly tonic drinks are then proper, to sustain the action of the stomach and favour digestion, which, by reason of the inactivity of the patient, is apt to go on more slowly than in health. The details relative to the regimen of wounded persons, have made us, for a moment, lose sight of the local treatment of wounds ; we now return to it.

The lint with which the wound was covered on the first day, adheres strongly, and the blood which flows, glues together the lint and compresses. Now if we should attempt to remove the dressings before they are moistened with purulent serum, we should excite much irritation and pain, and cause the wound to bleed afresh ; therefore, when the wound is large, we should not remove the dressings until the expiration of three or four days in summer, and four or five in winter : however, if, before this time, the blood in the dressings becomes fetid, we may change the bandage, compresses, and the loose lint, leaving only that which adheres. Formerly it was the practice to remove the first dressing at the end of twenty-four or thirty-six hours, which caused great twitching, and as much pain as the wound itself : so impressed were patients with the dread of the first dressing, that when the practice of deferring it to the fifth or sixth day commenced, they were agreeably surprised that it caused no pain.

Before removing the first dressing of a large wound, we should wash it with warm water, so that the bandage and compresses may easily separate ; but we must be careful not to continue this operation too long, lest the dressing come off altogether, and some portion of lint adhering to the mouth of a vessel be thus detached, and cause a

hemorrhagy, which is always very troublesome. We must remove the lint with care, so as not to excite pain: if any adhere by small threads, they should be cut with a scissars. If any vessels have been tied, we should envelope the ligatures in a little compress, so as to distinguish them easily, to avoid drawing on them. These little attentions require much skill and experience, and prudent practitioners prefer doing them with their own hands.

When all the loose lint has been removed without drawing, and without causing pain, upon the centre of the wound we should place a little fine lint, which imbibes the pus, and prevents its escape. The whole surface of the wound is then to be covered with dossils of lint, spread with an emollient ointment proper to diminish irritability and acute sensibility. This ointment, which is to be spread very thick the first three or four days, especially if any considerable portion of lint remain adhering to the wound, beside its soothing qualities, has the advantage of preventing the pus from penetrating too much into the dossils of lint, in such a way, that, being kept on the surface of the wound, it detaches the adhering portions. I commonly use ointment of styrax, mixed with cerate and oil of hypericum, in such proportions as to be of a proper consistence.

After the first dressing has been removed, the wound is to be dressed every day, or once in two days, according to the abundance of the suppuration. Too frequent dressings have several inconveniences: they expose the wound to the contact of air, which is always injurious to parts deprived of skin, and especially to suppurating surfaces; they remove the pus, the presence of which is calculated to keep the parts in a favourable state; and, lastly, the irritation they excite interferes with the process of nature, and retards the cure. Dressing too seldom is less injurious; but the presence of pus greatly relaxes the parts, and prevents their draining, thus rendering the wound stationary, or slow in its progress towards a cure; moreover, the pus becomes fetid, and injurious to the wound, by remaining too long.

The dressings should be made in such a way as to cause as little pain as possible. The first dressing, as we have observed, requires very particular attention; the wound is then extremely sensible, and the least drawing in any part of it excites severe pain: hence great care is required in removing the loose dressings, and separating them from parts to which they adhere.

In proportion as the wound becomes exposed, and suppuration increases, it is to be covered with a larger quantity

of dry lint, and the dossils, spread with ointment, are put on solely with the intention of moderating the inflammation, and promoting the formation of laudable pus.

When suppuration is well established, the ointment is to be omitted, and dry lint alone applied to the wound. The use of ointments too long continued, and especially the direct application of them to a wound, makes the granulations soft and spongy; they become edematous, the pus is serous, and the cure is retarded.* Dry lint prevents these injurious effects; its lightly stimulating quality keeps up the degree of inflammation necessary to the formation of good pus and the cleansing of the wound.

Dry lint alone is generally sufficient to cure even the largest wounds; but it is not always enough to fulfil the indications of nature during a long course of treatment. Old sores lose their vital action; they are disposed to relaxation in proportion to the time they have suppured. We observe, that all parts of our bodies, which are at first very irritable, and easily inflamed by the presence of foreign bodies, gradually accustom themselves to their contact, and finally are no longer affected by them; we may thence infer, that, after a long time, dry lint becomes incapable of exciting a sufficient degree of irritation to promote healthy suppuration. Thus experience proves that, in many suppurating wounds, advantage is derived from more active remedies. Dry lint is generally irritating enough; but when we perceive the granulations no longer affected by its presence, when they become flabby, and the pus loses its good qualities and becomes serous, we must have recourse to remedies somewhat more irritating, such as orgeat-water, or wine with honey; and if these lose their effect, to the balm of Mecca; and, finally, to the nitrate of silver, burnt alum, &c. The nitrate of silver, gently drawn over the edges of a wound every three days, is found to be very efficacious in keeping up healthy suppuration, and to prevent the granulations from becoming flabby, and thus to promote the cure.

Suppuration is always more copious in the centre of a wound than at its sides: hence the lint adheres to the sides, and in removing it we might tear the tender cicatrices. This may be avoided, by not putting any lint in contact with the circumference of the wound, and covering it with dossils spread with cerate; or by first covering the edges with plasters of cerate, and putting lint above.

By following these rules, we readily heal suppurating

* See note F.

wounds. But sometimes it happens that a wound, after doing well for some time, suddenly becomes stationary, or retrograde. When this takes place, we must study to find out the cause of the change, and endeavour to remove it.

The causes which retard the healing of sores, are external or internal.

Among the former we reckon errors in regimen; in fact, when near the cure of a wound, if a patient give loose to his appetite, and form, by too much nourishment, more fluids than are wanted, the wound is drenched, and relaxed; it ceases to diminish. Daily experience proves *embonpoint* to be an obstacle to the healing of a wound, and that a single hearty meal, followed by indigestion, will break open a cicatrix, and re-open a wound on the point of healing. It is, therefore, of the utmost importance to watch the patient, and to proportion the quantity of food to the state of the wound, and the *embonpoint* of the patient.

The internal causes which retard the healing of wounds are certain virus, and peculiar dispositions of the solids and fluids, which give them qualities opposed to the cleansing and cicatrization of the wound; such especially are the scorbutic diathesis, scrofula, and syphilis. For although most wounds that happen to scrofulous or syphilitic patients heal well enough, we are forced to allow, that these diseases prevent cicatrization, and require special treatment. Herpetic affections may also influence a wound, by producing in the neighbouring parts a papular and crusty eruption.

It is generally toward the end of the cure that these last-mentioned causes begin to act. We may suspect their existence, when the wound ceases to heal, and we cannot discover any local disposition which could produce this effect, and the patient has committed no error in his regimen. We judge of the nature of the internal disease, by the appearance of the wound, the peculiar symptoms of the disease, and the former diseases of the patient. Whatever disease is discovered to exist, it must be treated by the means which experience has found best.

The external or local causes which retard the healing of wounds are of several kinds.

Sometimes the healing of a wound becomes very difficult or impossible, because a great loss of substance has taken place, and, without any sinking, the wound must heal by means of cicatrization and desiccation, which are always long and difficult. Gun-shot wounds are particularly bad in this respect. General C—— received, before Courtray, at the

beginning of the revolutionary war, a cannon-shot, which carried away a portion of the calf and fibula; the loss of substance was prodigious. Perhaps it would have been better to have amputated the leg at once; but it was preserved. When the wound was reduced to the size of a dollar, he was brought to Paris. This wound, on a very thin leg, covered with large scars, resisted the skill of the ablest surgeons. After eighteen months it diminished to the size of half a crown, and obstinately remained so.

The healing of a wound may be retarded by the state of its edges: they may be hard and elevated, and thus prevent cicatrization. We should, in such case, soften them by suitable means; and if their edges be bounded by a thin skin, partly disorganized, it must be cut off. We shall speak of this subject more particularly in treating of ulcers and fistulæ.

But very often the mode of dressing wounds, as they approach their cure, prevents them from healing. We often see a wound, reduced to a very small size, furnishing very little pus, if we dress it with dry lint alone. In this case the lint adheres firmly to the circumference of the wound, and keeps up an irritation, which hinders it from healing; or if, in spite of this, a cicatrix be formed, it is torn off every time the lint is removed. This may be prevented, by covering the wound with very fine lint, and placing over it a dossil, thinly spread with cerate. By these means we prevent the lint from adhering, and keep the edges in a moist state, proper for healing. But to derive from this mode of dressing the greatest possible advantage, the lint should be placed so as not to touch the edges of the wound, or if it do, it ought to be of such a degree of thickness, that the cerate will easily penetrate through it; at the same time the cerate must not be spread thickly, because it would then relax the granulations, especially if plenty of lint were not applied.

Finally, when wounds are so situated that the parts have between them great intervals filled with cellular substance, and this cellular substance has been destroyed by suppuration, extreme emaciation of the patient may be an obstacle to the cure, if the mechanical disposition of the parts do not allow them to fall together. We have already spoken of this case; we shall treat of it again.

ARTICLE III.

Of the Complications of Wounds.

The complications of wounds are primary and secondary.

SECTION I. *Of Primary Complications of Wounds.*

These are hemorrhage, pain, inflammation, tetanus and palsy.

Of Hemorrhage.

Hemorrhage is an abundant effusion of blood, proceeding from a vessel opened by the instrument which has caused the wound. We are not to confound hemorrhage with the slight effusion of blood which takes place in every division of parts. The first requires particular means to arrest it; and the life of the patient may be lost, if these means be omitted, or ill directed; while the latter ceases of itself, by the contraction of the vessels, or a very slight compression. Hemorrhage almost always takes place at the moment the wound is inflicted. Sometimes, however, it comes on after two or three days, either because the compression has ceased to be properly applied, or because the separation of an eschar has opened the mouth of an artery, as often occurs in gun-shot wounds; or because the orifice is contused and mashed. In this last case, hemorrhage occurs after suppuration has commenced.

Hemorrhage from arteries is always greater and more dangerous than that from veins. Thus we have examples of wounds of very small arteries leading the patient to the brink of the grave, while the opening of the largest veins is rarely dangerous.

Physiology explains this difference. The blood circulates in the arteries by the impulse it receives from the heart, and the re-action of the arterial coats. These two forces united, impart to it so much velocity, that it juts out per saltum, to a considerable height, when an artery is opened, so that by the laws of the circulation almost all the blood of the body will, in a given time, present itself to the orifice of the vessel. Venous blood circulates more slowly, because it receives no impulse from the heart: hence venous hemorrhages generally stop spontaneously, or are arrested by a slight compression. If a vein hav

been opened, a clot forms at the orifice, and adheres to the surrounding parts. The vein preserves its caliber, and the blood circulates as before. If the vein be cut across, the circulation through it ceases, and the blood passes through the collateral branches.

Venous hemorrhage is difficult to stop, where there is compression above the opening. This sometimes occurs in women who are bled during pregnancy. They draw up the sleeve of their gowns, so as to compress the veins. Surgeons have supposed, in some cases of this kind, that they had opened the brachial artery.

The hemorrhage from a large vein may become very dangerous, when the vein is the only one belonging to the limb; for then the compression or ligature necessary to staunch the blood, hinders its return to the heart, and the member swells so prodigiously, that gangrene may supervene. For example, if the femoral vein were opened at the groin, above its juncture with the saphena vein, there would result from the compression necessary to stop the bleeding, a great tumefaction, and its necessary consequences.

Often when the bleeding vein is situated in a cavity, the hemorrhage may prove fatal, not only by reason of the quantity of blood effused, but also by its collecting in the cavity. What we shall treat of at present only relates to wounded arteries.

Whatever vessel causes the hemorrhage, it is always more dangerous when it is internal than when it is external. The impossibility of employing any mechanical or surgical means, sometimes renders the hemorrhage, from a very small vessel, exceedingly dangerous, and even fatal.

If the wound be external, the danger is in proportion to the caliber of its cavity, and its depth from the pressure; and hemorrhage from a middling sized artery, situated very deep, is more dangerous than that from a large artery that is superficial.

Hemorrhage is more or less serious, as it takes place from a wound made by a surgeon, or by accident. In the former case, all the circumstances having been previously foreseen, the surgeon is prepared to stop the blood, when he thinks proper. In the second case the patient may be out of the reach of assistance, and die before a surgeon can see him.

The moral and physical state of the patient influences the wound. If a person, in whom an artery is opened, be frightened into syncope, at the first sight of blood, the he-

hemorrhage ceases at once. Syncope, from loss of blood, is a means of arresting hemorrhage, at least, if it continue for a long time. A clot shuts up the vessel until the surgeon arrives.

We observe that hemorrhage stops more easily in persons in good health, whose fluids have preserved their natural qualities, than in those whose fluids are vitiated, and whose solids are in a state of atony. Thus in scorbutic constitutions hemorrhage is always very troublesome.

Such are the different circumstances which render hemorrhage more or less dangerous. Let us now consider in what manner nature proceeds in closing open arteries. This point of doctrine being of great practical importance, should be examined in all its details.

If an artery be entirely cut across, its ends retract and bury themselves in the adjacent parts; but this retraction is inconsiderable, and does not always take place. We have seen in a wound of the hand, with injury of a branch of the radial artery, the two ends of this vessel completely divided, without retracting, but, in fact, projecting from the surface of the wound, so as to be easily taken up and tied. But when an artery is situated between muscles, and not in the substance of any one of them, and the cellular tissue which surrounds the muscles is lax, then it sensibly retracts, and becomes buried in the flesh. On the other hand, the sides of arteries are extremely contractile, and constantly have a tendency to approach each other. By virtue of this power the arteries contract in diameter, in proportion to the diminution of the quantity of blood they contain. We see this in the *canalis arteriosus*, and in the umbilical arteries, which, after birth, contract, and finally close; becoming converted into ligamentous cords. When then an artery has been cut across, its diameter must diminish by the retraction of its circular fibres; and this diminution may go so far as to close entirely the orifice of the vessel, and prevent the further escape of blood. In this way nature arrests hemorrhage in divided arteries; they become obliterated from the seat of the wound to the first considerable collateral branch which they give off.

But nature can arrest hemorrhage only when the wounded artery is very small: if the caliber of the artery be considerable, art must interpose its aid; without it, the vessels would never contract enough to resist the impulse of the blood, and the hemorrhage would continue. When the orifice of the artery is closed by one of the means which we shall presently speak of, the blood that arrives there is

stopped, and forms an oblong clot, which fills the artery. This clot gradually becomes harder; it adheres to the sides of the arterial coats, which continue to contract, and the artery becomes entirely obliterated to the first considerable collateral branch that it gives off. But different opinions have existed in regard to the formation of the clot. J. L. Petit, one of the first who has examined the subject with attention, and who, by a course of experiments upon living animals, and observations on man, discovered the mechanism of nature in this obliteration, evidently found the clot formed by coagulated blood at the extremity of the divided artery. Pouteau does not absolutely deny the existence of the clot, but he regards it as unnecessary to the obliteration of the artery, which he attributes to the tumefaction and swelling of the flesh, and cellular tissue embraced by the ligature.

The explanation of the phenomena observed in a disease is of little moment when it has no influence upon practice; but Pouteau has drawn from his opinion of the manner in which the obliteration of an open artery takes place, a practical deduction, which appears contrary to sound surgery, as we shall see in treating of the means of art for arresting hemorrhage.

When an artery has been opened laterally, whether transversely, obliquely, or longitudinally, the wound does not cause, in the form of the artery, any change which can hinder the blood from flowing, even when the artery is small: the retraction of the arterial fibres, on the contrary, tends to enlarge the opening. The aid of art then always becomes necessary. But by what process does nature, seconded by art, effect the consolidation of an artery opened laterally? J. L. Petit has said, that in this case a clot forms, which fills the opening of the wound, and exactly closes it, without obliterating the artery in which the circulation continues. According to Petit this clot is shaped like a nail, the point of which equals in length the thickness of the coats of the artery, while its extremity, which corresponds to the column of blood, is worn off by the friction it undergoes. The head which corresponds to the exterior part of the artery is very broad; it contracts adhesions with the external surface of the artery and the adjacent cellular tissue. These adhesions become stronger, and when they are well cemented the artery is healed, and the clot cannot be displaced by the impulse of the blood which continues to pass through the artery as before. But does nature thus consolidate an artery which has been opened, and when the opening of an artery is only stopped up by a clot, is the cure perfect and radical?

In the first place it seems difficult to conceive that compression of an artery, laterally opened, should be sufficient to stop the bleeding, without being strong enough to approximate the sides of the artery, and to bring them into immediate contact, so as to cause them to adhere.

In the next place, when we consider that most persons who have had an artery pricked, and who have been treated by compression, have had a false aneurism for some time, we cannot refrain from thinking that their cure was only apparent. In this way false consecutive aneurisms appear after an injury of the brachial artery in bleeding, when compression has been used: the patient is thought to be cured, and the surgeon feels perfectly secure; but in three or four months, sometimes later, the clot by which nature has arrested the hemorrhage, becomes detached, and the blood is injected into the cellular tissue, forming an aneurismal tumour.

J. L. Petit showed, it is true, to the Royal Academy of Sciences, the brachial artery of a man who died suddenly, two months after he was cured of a wound of that vessel: the lips of the wound of the artery had not united to each other; the blood was stopped by a clot which closed the opening, and which adhered to the whole circumference; but in this case the cure was only apparent; and had the man lived longer, the clot, without doubt, would have been displaced by the impulse of the blood, and a false consecutive aneurism would have supervened.

At the present time, all practitioners agree that wounded arteries heal only by obliteration, and that the cure produced by a clot which stops the wound of an artery, is not complete and radical, and that it exposes the patient to a false consecutive aneurism.

We have spoken of the process of nature in the cure of lateral openings of arteries, only because it gives rise to practical inductions respecting the proper means of arresting hemorrhage. In fact, if a punctured artery heal by means of a clot, and present its caliber, compression would be the best means of arresting hemorrhage; but if compression, when it only retains the clot at the mouth of the vessel, produce an incomplete cure, and expose the patient to a false consecutive aneurism, it is a bad remedy, and ought to be rejected. Even if, on the contrary, it obliterate the vessel, and this obliteration be necessary to the cure, it still remains to be decided, if the ligature be not preferable. We shall hereafter discuss this subject.

Of the Means of arresting Hemorrhage.

The means of arresting hemorrhage from wounds, are astringents, absorbents, styptics, cauterization, and ligature.

Astringents act by producing a contraction, and a kind of crisping of the vessels. These remedies, among the principal of which is alum-water, can only be useful in the hemorrhage of very small arteries, and those upon which we cannot otherwise act. Thus they are used in nasal hemorrhages, which are not considerable, and then they are applied directly to the vessels themselves, by making the patient snuff them up, or by injecting them into the nostrils; sometimes by applying them to the forehead and temples. In this case cold water is frequently employed. Uterine hemorrhages, which depend upon want of action in the uterus after delivery, may also be arrested by applying compresses wet with cold water to the abdomen, or even by injecting it into the uterus.

But in hemorrhages arising from a wound, astringents are in general feeble remedies, and insufficient to stop the bleeding of a large vessel; on the other hand, if the vessel be small, compression and a suitable dressing are sufficient.

Absorbents, such as lint, fine dry sponge, the nest of the ant of Cayenne, agaric, &c. are soft, porous, pliable substances, calculated exactly to close the mouth of the bleeding vessel, to soak up the serous part of the blood, and to form with it a hard substance. Among the absorbents, agaric is that which has enjoyed the greatest consideration. In the 2d volume of the Memoirs of the Royal Academy of Surgery, extraordinary praises have been lavished upon it. But experience has proved that agaric, as well as all other absorbing substances, is efficacious only by the compression it imparts to the open artery, thus opposing the escape of blood, and favouring the obliteration of the bleeding vessel: hence, at the present time, it is little used, and now, when compression is trusted to, small balls of lint are applied to the bleeding orifices.

Styptics differ from astringents only in the degree of their activity; they hold a middle rank between astringents and caustics. Spirits of wine, Rabel's water, a strong solution of the sulphate of copper, are those which are most employed. Those in which the pledgets of lint are soaked and applied to the bleeding vessels, produce a strong contraction, and crisping of their mouths: hence they may be useful in moderate hemorrhages. It would not be prudent to trust

to them, when the blood is flowing from a considerable artery, unless we could aid them by a slight bandage; but, even in this case, it is better to employ lint, or some other absorbent, because styptics produce an unpleasant degree of irritation, and excite high inflammation in the part to which they are applied.

Cauterization is made with the actual cautery, that is, red-hot iron, or with caustics. These last are little used. The gangrenous eschar which they form is too soft, and is too quickly detached, to afford a solid barrier to hemorrhage from a large vessel. The actual cautery, which the ancients greatly abused, produces a more dry eschar, which is hard, and separates with more difficulty, and therefore is more efficacious.

But cauterization of every kind has this great inconvenience; the gangrenous eschar, while it opposes the impetus of the blood, contributes not at all to the falling together of the sides of the artery. They approach, it is true; but if the artery be large, they do not approach sufficiently to touch each other, and adhere: besides, nature separates the eschar before the obliteration of the arterial tube, hemorrhage re-commences, and we are obliged to cauterize again. At the second cauterization, the mouth of the vessel is deeper, and the difficulty of stopping the hemorrhage is greater than before; and if several cauterizations have been unsuccessfully made, the mouth of the vessel may be so deep, that we are obliged to have recourse to the uncertain means of compression, from the impossibility of applying the ligature. Cauterization has another inconvenience—that of causing much pain, and destroying immediately the parts which surround the cauterized vessel.

Nevertheless, there are some cases, in which cauterization is best: when, for instance, the artery is very small, and situated in a part which renders compression impracticable, and when it cannot be tied; in which case, cauterization almost always succeeds, because the artery closes up before the eschar is thrown off: thus, for example, in a wound of the ranine artery, either from the operation of cutting the *frænum linguæ*, or by accident, the softness and mobility of the tongue render compression impracticable, and a ligature cannot be applied; the hot iron is then the only resource, and it is perfectly successful, although it do not touch the very mouth of the bleeding vessel.

The following is a case, in which the life of the patient would have been endangered, if the hot iron had not been applied. A servant was playing on a jew's-harp: some one

gave him a blow, which drove the instrument into his mouth; the blood flowed; a surgeon was sent for, who directed astringent gargles; they did not answer: he next stuffed the mouth with lint, and bandaged the upper and lower jaw together, but to no purpose; the bleeding continued for twenty-four hours, and the patient was almost exhausted, when Bradsdor, a professor in the ancient school of surgery, who related the case to me, was called in. His first care was to see where the blood came from. He emptied the patient's mouth, and washed it clean: he saw the hemorrhage proceeding from the inferior and anterior part of the tongue; he heated an iron slyly, and put it on the place whence the blood flowed; an eschar was formed, the bleeding stopped in an instant, and the patient got well.

The only truly efficacious means of arresting the hemorrhage of a large artery, are compression and ligature. As these two remedies have divided the confidence of surgeons, and have alternately obtained an exclusive approbation, we shall examine particularly their effects and mode of acting, and the cases in which one is preferable to the other.

Compression consists in subjecting an artery to a sufficient degree of pressure to stop the circulation through it, and give time for its obliteration. It may be made by a bandage, or by an instrument.

Lateral compression is that which acts upon one of the sides of an artery, and perpendicularly to its length.

Direct compression is made at the extremity of the vessel, or opening of the divided artery, in a line coinciding with its length.

Lateral compression may be made at the place of the wound, or between the wound and the heart.

It has been said, that lateral compression made at the place of the wound, may act in two different ways, either by supporting the clot within the artery, or by bringing the sides of the artery in contact; thus giving it the form of the pipe of a hautboy. At present, however, it is believed that lateral compression acts in this last way only.

Lateral compression between the heart and the wound, produces its good effects only by flattening the vessel, and keeping its sides in contact until they adhere to each other.

Lateral pressure, whether made on the wound or between it and the heart, is distinguished into immediate and mediate.

Immediate compression is that in which the first part of the dressing is applied directly to the bleeding orifice.

Mediate compression only acts upon the vessel through a thickness of soft parts.

Lateral compression pushes the artery before it, and crowds in the soft parts on which the artery rests. Now, if these parts have no solid support, they yield, and elude the compression, which thus becomes insufficient to arrest the hemorrhage, however strong it may be.

If lateral compression be mediate, the soft parts, throughout which it acts, yield, and part of the compressing force is thus lost. This loss is in proportion to the thickness of the soft parts; if that be very great, the compression has no effect upon the artery.

This inconvenience might be remedied, by proportioning the force of the compression to the thickness of parts through which it has to act; but such a degree of pressure would be intolerable, and, if carried very far, would produce gangrene.

From what has been said, it is easy to see to what cases lateral compression is adapted, and that it can be useful only in those arteries which have a solid point of support beneath; such, for instance, as the temporal and occipital arteries, the anterior aural artery, and the radial artery near the hand.

In these cases, the method of making compression is the following: Having washed away the blood which fills the wound, a hard ball of lint, a bit of agarie, or a piece of money, wrapped in linen, is to be placed on the bleeding vessel; over this compresses are to be placed, each being larger than the former, so that the whole shall resemble a pyramid, the apex of which rests upon the orifice of the wounded vessel: the whole is to be kept on by a circular bandage. In this way the strongest pressure may be made in the place where alone it is required: the rest of the limb is not compressed; the circulation of the blood remains unimpeded. This apparatus is sufficient for arteries of middling size; but if the artery be large, and the structure of the part permit, it is better to use a tourniquet, by which the pressure may be regulated at pleasure; and it only acts upon two points of the limb, viz. upon the open mouth of the artery, and upon the part directly opposite to it.

Lateral compression being efficacious only as it approximates the sides of an artery, and keeps them in contact until it is obliterated, it must be strong enough to produce this effect; but it is impossible to determine the degree of force necessary for this flattening of the artery, because it varies according to its size, its distance from the compressing power, and the point of support afforded by parts below. When there is a solid point of support beneath, the slightest

pressure, even that of a finger, is sufficient to stop the course of the blood ; but, in a great number of unfavourable cases, the strongest compression is hardly sufficient to arrest a small hemorrhage. In such instances, if we continue to compress the parts, we expose the patient to tumefaction, convulsions, &c. which may prove fatal, as I have often seen happen.

A young man received a wound in the posterior tibial artery on the lower part of the leg, near the internal ancle. The internal malleolar and tarsal arteries, which run over the foot, were also divided. They all died ; they might have been saved, if, instead of cramming up the wounds, the surgeon had cut down upon the arteries, and tied them.

When the other arteries possess the conditions necessary for successful lateral compression, we may avoid the injury arising from compressing the wound, by pressing upon it between the wound and the heart. The wound is then to be treated as a simple wound. I have treated in this way, with complete success, wounds of the temporal arteries, and those of the artery running over the foot. When, by compression, we have stopped the bleeding, we must continue it for a long time, otherwise the patient is exposed to a false consecutive aneurism. Thus I have seen this aneurism come on, after a wound of the brachial artery in venesection, from the compression being relinquished too early. The length of the time of compression must be proportioned to the magnitude of the artery, its distance from a solid point of support, and the thickness of the soft parts over it.

For some hemorrhages, lateral pressure is the only remedy ; that, for example, which results from a wound of an intercostal artery—from the internal pudic, in the operation of lithotomy : but, in all other cases where the ligature can be applied, it is better, because it is more sure, less painful, and because it causes less inflammation, and is less apt to produce gangrene.

Direct compression, applied to the end of a divided artery, does not change at all the form of the vessel ; it resists only the momentum of blood, tending constantly to escape : hence it is less likely to produce an obliteration of the artery than lateral pressure, and still less than the ligature. Its application, therefore, which was formerly extended to all cases of amputation, is limited, at present, to certain hemorrhages. These hemorrhages are, 1st. That which, after the amputation of a limb, proceeds from the principal artery, which is ossified, of which we find an example in J. L.

Petit. 2d. The hemorrhage produced by the opening of an artery, seated in the substance of a bone. as the medullary artery of the tibia, which is sometimes cut in the amputation of the leg ; the middle meningeal artery, in certain cases. is enclosed in the substance of the parietal bone. and would be opened, if we should trepan at its anterior and inferior angle ; the small arteries at the bottom of the alveolar sockets, penetrating into the teeth, and necessarily torn in extracting them. 3d. Hemorrhage, which results from an injury of the epigastric artery in the operation of paracentesis. We shall hereafter lay down rules for making direct compression in these different cases.

The ligature consists in enclosing an artery with a waxed thread, or with a sort of small ribbon, composed of several threads, one by the side of the other, and strangling, as it were, the artery, to obliterate its cavity and arrest the flow of blood. The ligature itself is a kind of circular compression, which brings all the points of the circumference of the artery towards its centre, and forms at its end a *cul-de-sac*, in which the blood is stopped. The impulse which the blood communicates to the extremity of the artery, is so great as to cause a considerable pulsation when the ligature is first applied, but it gradually diminishes, and finally disappears.

We find some traces of the ligature in the writings of Hippocrates, Celsus, and Galen ; but they speak too lightly of this remedy, to deprive Ambrose Paré of the glory of his discovery, or at least of the application which he made of it, for the first time, in amputation of the limbs.

Without giving a history of the ligature of arteries, which, since the days of Paré, has been sometimes employed and sometimes abandoned, we shall consider, in the first place, the different modes of using it ; we shall afterwards examine the objections that have been offered to it, and inquire if there be any other means so exactly calculated to answer the end in view.

There are two modes in making the ligature of vessels that have been entirely divided. Sometimes the extremity of the artery is taken hold of with a dissecting forceps, and drawn out a little, while an assistant ties it in the same manner that the umbilical cord is tied in a new-born infant. This ligature is called immediate. Sometimes you pass around the artery, by means of a crooked needle, a wax thread, which forms a kind of circle, in which are comprised the artery and the surrounding soft parts ; and it is through these parts that the artery is compressed, when the thread is drawn and tied. This kind of ligature is called mediate.

The immediate ligature, in which is always comprehended a little cellular tissue which surrounds the artery, strangulates its mouth, and causes swelling in the part without the ligature, and a small tumour, which is formed like that which takes place when the end of an intestine is tied. The effect of the ligature being to cut the part which it embraces, and to prevent the blood from circulating below it, the small tumour becomes detached with the ligature, in a longer or a shorter time, according to the size of the artery that is tied, the quantity of cellular tissue, the size of the thread, and the force with which it has been drawn. When this separation takes place, the artery is obliterated, and hemorrhage does not return; but sometimes it happens that this obliteration is not complete, either because the ligature has been thrown off too soon, or from some other cause which it is difficult to determine, and then the blood flows anew, and we are obliged to tie it again.

The mediate ligature acts also in strangulating the mouth of the artery, and in bringing the circumference to the centre; but before its action can extend to the artery itself, it must compress the soft parts between the artery and itself, so that, if they are very thick, the thread must be drawn exceedingly tight, to obliterate the caliber of the artery, and arrest the hemorrhage.

The mediate ligature comes away much later than the other; it is then exceedingly rare that the artery is not obliterated, or that hemorrhage returns.

We shall now speak of the respective advantages and disadvantages of these two kinds of ligatures, and describe the mode of applying them.

The immediate ligature, as it comprises only a small portion of cellular tissue with the artery, is not very painful; or if so, from the circumstance of its embracing some small nervous filaments, the pain, though severe at first, soon ceases. This ligature causes little irritation of the wound, and never occasions the nervous and inflammatory symptoms which accompany the mediate ligature.

It has been objected to the immediate ligature, that it is displaced, and even thrown off, by the impetus of the blood; but a quantity of cellular tissue is always included in it; the swelling of which, added to that of the coats of the artery, causes a small tumour, which sufficiently resists the force of the blood. The immediate ligature cannot be displaced, unless it have been put on too near the end of the artery, because the swelling of the cellular tissue which surrounds it, hindered the operator from drawing it beyond the surface

of the wound, or because his assistant, in tying it, has drawn the threads obliquely, in such a way that the thread, although at first high enough up, has slipped, and approached the extremity of the vessel.

It has been further objected to the immediate ligature, that it cuts the artery before it is obliterated; but this can only take place when the thread is too thin, or is drawn too tight for the size of the artery; for when we use a ribbon, and only draw it with sufficient force to resist the impetus of the blood, it very rarely separates before the perfect obliteration of the artery.*

The objections which have been made to the immediate ligature, apply only to its improper application. They may be avoided in the following manner. The surgeon takes hold of the artery with a dissecting forceps, embracing the two extremities of its diameter if it be small, and in passing one of the branches of the forceps within the artery, if it be large, as in the case of the crural or brachial artery. The artery being thus seized, the surgeon draws it from the surface of the wound, sufficiently for the application of the ligature by an intelligent assistant. Some practitioners make the first knot loose around the forceps before seizing the artery, and others pass the thread on one of the sides of the forceps, but do not make the knot until the artery has been taken hold of. In either case, the aid, after he has pushed the thread high enough with his finger, tightens it, by drawing its ends perpendicular to the direction of the artery: he next makes a second knot, to secure the first. The tightness with which the thread is to be drawn, should be in proportion to the size of the artery. When we use several threads, they are to be placed by the side of each other, and kept together by wax, so as to form a kind of ribbon. It is difficult to determine exactly the force to be used in tightening the knots; much force, however, is never necessary, even for the largest arteries; and after the blood is stopped, a little more compression is sufficient to resist its greatest impetus.

In tying very small arteries, it is impossible to avoid including some small nervous filaments, because they cannot be seen; but in larger arteries it is easy to distinguish the accompanying nerve, which should never be comprehended in the ligatures, since it would unnecessarily occasion severe pain.

The mediate ligature is much more painful than the im-

* See note G.

mediate, because it includes very sensible parts; severe pain, and very serous nervous affections sometimes ensue: hence some practitioners have rejected the ligature, and prefer compression.

Notwithstanding these objections to the mediate ligature, it was the only one which was used for a long time, because it was considered most certain. It is true, as we have already observed, that the mediate ligature rarely separates before the complete obliteration of the artery; but it exposes the patient to hemorrhage other ways; for the parts comprised with the artery are cut after a time by the thread which compresses and strangulates them; and as the ligature does not contract during this diminution of the parts which it encloses, it results, that it must cease to compress the artery: thus hemorrhage sometimes ensues in this way: I have seen it come on after an operation for aneurism.

In the mediate ligature there is necessarily a considerable quantity of flesh included; but authors have greatly differed as to the quantity which ought to be comprised between the threads. After Louis, Garengot is the first who advised to comprehend much flesh in the ligature. This precept was, no doubt, founded upon the idea of the premature separation of the ligature, and of its expulsion; but we have seen that this fear is groundless. There is no sound reason for employing a method from which disagreeable symptoms constantly result; moreover, large ligatures are less sure in their effects, than those which comprehend only a little of the cellular tissue which surround the artery; for the thread cuts the parts which it embraces most speedily when it is drawn tighter: and as large ligatures require to be most tightly drawn, they soonest become loose, and occasion the return of hemorrhage. Pouteau went farther than all his predecessors; he rejected the ligature, because he could not place the artery in the centre of a ribbon; but the advantages of large ligatures, so much insisted upon by Pouteau, must have been counterbalanced by strong objections; since the use of small ligatures, the superiority of which are so well explained by Louis and Monro, finally prevailed, or at least unprejudiced experience, adopted the method of including in the ligature as little as possible, and especially of avoiding nerves, the tying of which is attended with serious consequences.

To determine exactly the manner of applying the mediate ligature in wounds of large arteries, we shall reduce them to the three following cases.

1st. Wounds resulting from a surgical operation, other than an amputation of a limb.

2d. Large incised wounds, in which an artery is cut across.

3d. Wounds made by puncturing instruments, in which a large artery is pricked at some distance from the place where the instrument first entered.

In the first case we must, if possible, seize the artery with the forceps, and apply the immediate ligature: if this cannot be done, we should use the crooked needle, comprehending as few parts as possible.

In the second case, that is to say, when an artery has been divided by a cutting instrument, with a considerable wound of the soft parts, it is almost impossible to seize the artery, and put a ligature directly on it; we must then comprehend in the ligature the surrounding soft parts: for this purpose a crooked needle, carrying a waxed thread, is necessary; it is to be held in such a way, that it may be pushed from without, inwards; the point is to be plunged into the flesh at one side of the artery, so as to pass below it, and come out at the opposite side, embracing at least three quarters of the circumference of the vessel: if necessary, the lower end may be tied in the same way; but when the depth of the artery renders it impossible to tie it in this manner, we must previously cut along its course through the parts which cover it.

In the third case, that is, when a large artery, such as the crural or brachial, has been opened by a puncturing instrument, we are to cut down upon it, and to put a ligature above and below. We shall explain the manner of making this ligature when we treat of false primitive aneurism. In whatever way we have passed the thread around the artery with a crooked needle, when the thread is drawn sufficiently tight, it is to be cut near the needle, and two simple knots are to be made, one above the other: the first knot should be drawn tight enough to oppose an insurmountable obstacle to the blood; but care should be taken not to draw it too tight, lest it cut through the artery before it is obliterated: the threads must be drawn in a direction perpendicular to the axis of the artery; to do this the threads must be passed over the thumbs, which are pressed against the surface of the wound, when the ligature is made; the two ends of the thread are to be slightly twisted together, and brought to one of the sides of the wound, covered by a small piece of linen, that they may be distinguished from the dressings. We shall explain the mode of making the mediate ligature in amputation of the limbs when we speak of this operation.

In other operations, and especially in the extirpation of

cancerous tumours, every considerable artery should be tied as soon as it is cut, instead of letting an assistant compress it with his finger until the operation is finished, according to the practice of many surgeons; for it often happens that when the operation is over, and the wound is washed with warm water, the vessels cease to bleed, and we cannot then tie them. This arises from the weak state of the patient, and the retraction of the vessel; but as soon as the circulation resumes its vigour, hemorrhage appears, and we cannot prevent the bleeding, but by crammimg lint into the wound: hence we are obliged to take off the dressings to tie the vessels, which is always to be dreaded, and which may indeed prove fatal. I have seen several cases of this kind, especially after castration, and it is an important rule to tie the arteries as soon as they are wounded.

There is no fixed time for the separation of the ligature; it depends upon the size of the artery, the quantity of soft parts that are included with it, and the force with which the ligature has been drawn. When it remains a long time, its detachment may be accelerated by drawing on the thread at each dressing.

It may be seen, from what has been said, that there are three efficacious means of arresting the hemorrhage from large arteries. 1st. The ligature, which is suited to the greatest number of cases, and which is the surest and least painful means, when it is employed in the manner we have pointed out. 2d. Compression, which is suited to certain cases that we have designated. 3d. Cauterization with a hot iron, which, in certain circumstances that have been mentioned, is the only remedy that can be employed with advantage.

Although the general remedies, such as bleeding, low diet, and internal medicines, have little effect on hemorrhage arising from wounds, they are, nevertheless, not to be neglected; their use favours the action of the mechanical or local means.

Bleeding, when the patient is young and vigorous, and the hemorrhage has not been excessive, may be employed with great advantage; it diminishes the distension and the tone of the solids, and the blood not being thrown with so much impetuosity through the vessels, if those which bleed be small, their orifices may contract sufficiently to arrest the bleeding; or if the wounded vessel be large, the blood will be thrown against the ligature with less force, and the compression will be more certain.

When the hemorrhage has been stopped by some one of

the means we have described, we must be careful to avoid every thing which might augment the quantity of blood, or increase the force of its circulation. Wine and cordials must be proscribed; broth must be the patient's only nourishment; he must breathe the fresh air, and keep himself, and especially the wounded part, perfectly quiet.

Internal astringents have been much resorted to, as remedies for hemorrhage; but if they cannot arrest it when applied directly to the bleeding vessels, what can we expect from them taken internally? They are then submitted to the action of the stomach, where they must necessarily undergo some change, and from thence they can reach the bleeding vessels only after going the round of circulation. As hemorrhage, proceeding from a great number of small vessels, often stops spontaneously, or is arrested by the slightest pressure, good effects have been attributed to astringents when used in such cases, and, from this circumstance, they have been considered as specifics for hemorrhage. A number of those remedies that have been greatly praised, may be taken without either injury or benefit; but a modern surgeon knows his duty too well to expose his patient by neglecting those certain means—ligature or compression. There is, however, one case in which compression would have little effect without the administration of internal remedies, when the patient is affected with scurvy, and the blood flows from a large surface of a swollen spongy wound. Antiscorbutic medicines, in these cases, act with more efficacy than local remedies. Here is an example of it: I amputated the middle finger of a man fifty years old, for caries of the bone, in consequence of whitlow. The collateral arteries were tied; the ligatures came away on the seventh day; no hemorrhage succeeded: shortly after the lips of the wound became bloated, black, soft, and spongy, and bled freely on the slightest touch. From this time the patient experienced, every day, considerable hemorrhage, to which I opposed, in vain, the ligature, for it tore the parts which it embraced, and compression did not extend to the orifices of the bleeding vessels, on account of the puffy state of the parts. This bloated appearance, the state of the gums, the violet spots which appeared in several parts of the body, and especially on the legs, left no doubt of the existence of scurvy; I therefore gave the juice of scurvy-grass, and that of lemons, in large doses. These remedies soon rendered the hemorrhage less frequent, and less abundant; the parts diminished in size, and became firmer: laudable suppuration succeeded, and the wound soon healed. I shall

remark, at this time, that the scorbutic diathesis, in a small degree, may have great influence upon wounds : hence surgeons should attend to it, and treat it with the proper remedies.

In ordinary cases of hemorrhage consequent to wounds, the only internal remedy is cold acidulous drinks. The English surgeons make great use of opium in all hemorrhages ; but this remedy can only be useful in cases where it is accompanied with very severe pain, or spasm.

Of Pain.

Moderate pain is inseparable from all wounds. When it is universal, severe, or long-continued, it forms one of the complications of wounds.

The pain attending wounds is generally moderate, and gives rise to few constitutional symptoms. The wound is painful for five or six hours ; the pain then diminishes, and soon ceases, especially if the wound have been properly dressed. But, in some cases, the pain is so acute as to cause real disorder in the animal economy. It produces inquietude, agitation, change of posture, watchfulness, fever, heat, thirst, dryness, and sometimes even convulsions, particularly in persons of nervous constitutions.

When a wound is attended with pain, we are carefully to inquire into its cause, in order to relieve it ; for every pain does not yield to the same remedy.

The ordinary causes of pain are, 1st. Puncture, incomplete division, or laceration of nervous filaments. 2d. The pressure of some foreign body. 3d. The presence of an effused fluid. 4th. High inflammation. 5th. Improper modes of putting on the dressing, and the application of acrid, irritating substances.

When the pain which attends a wound depends upon the partial division, the puncture, or laceration of nervous filaments, relaxing anodyne applications are proper ; and if these means do not succeed, the nerves affected are to be completely divided, or destroyed by caustic.

The pain arising from the presence of a foreign body ceases when it is extracted.

If the pain depend upon a collection of blood, or other fluid, in the wound, or in the cavity of an organ connected with the wound, the effused fluid must be evacuated. Thus, after the operation for the stone, blood sometimes collects in the bladder, and causes acute pain. By introducing the finger through the wound, and breaking down the clots, the blood and urine are discharged, and the pain ceases.

When pain arises from violent inflammation, we are to treat it by venesection, low diet, cooling drinks, and emollient anodyne applications.

Lastly, when the pain depends upon improper dressing, or the application of acrid irritating substances to the wound, the dressing must be properly put on, and the offending materials removed.

But if the cause of the pain be unknown, or when known, be irremovable, we must have recourse to narcotics, and especially opium. Daily experience proves, that this remedy, in proper doses, quiets the patient in the most beneficial manner. It may also be used externally, by dissolving it in water and wetting compresses with the solution, or by adding it in substance to the ointment; but we should have recourse to it only when the pain is excessive; and it must be left off as soon as possible, because its long-continued use might too much diminish the inflammation of the parts, and prevent suppuration.

Of Inflammation.

Inflammation can only be considered as a complication of wounds, when it is greater than is necessary for their cure. It varies in degree in different wounds.

In simple wounds, the lips of which can be kept applied to each other, the slightest inflammation is sufficient to procure adhesion; and however trifling the inflammation may be, we should consider it as opposing the immediate cicatrization of the wound. It is, therefore, necessary to avoid, with great care, every circumstance tending to create irritation, and consequently to induce inflammation.

Wounds, made by cutting instruments, which are not, or cannot be brought together, must of course suppurate, and are attended with a more considerable degree of inflammation, which is indeed essential to their cure; but when the inflammation runs very high, it is to be regarded as a complication, and is to be treated in the way we shall point out. In large wounds it is dangerous, and may be fatal—severe delirium, &c. supervene. But the contrary state, that is to say, the absence of inflammation on the third or fourth day of wounds which must heal by suppuration, is much more serious, as it indicates a want of vital energy sufficient for the suppuration and healing of the wound.

In contused, and especially in gun-shot wounds, the inflammation which precedes the establishment of suppuration, is always sufficient: hence the complication of inflam-

mation is more frequent in this than in other kinds of wounds; it also often occurs after punctured wounds, especially where parts having many nerves are injured, as the hands for example.

Inflammation is almost always a primary consequence of wounds; however, it may appear at any period, and does so sometimes when they are on the point of closing. The causes which produce it, are external or internal. The external causes are, long exposure of the wound to cold air, which irritates the nerves, dries the flesh, closes the orifices of the vessels, and retains the fluids in them; spirituous, acrid, and irritating applications, have the same effect; compression, made by foreign bodies, especially by too tight bandages, or by part of the dressings rubbing against the wound; to which may be added, the nature of the wound itself, when the nerves have been bruised, punctured, or torn. The internal causes are, a disposition of the solids and fluids, denominated the inflammatory diathesis, which may exist either alone, or combined with derangement of the *primæ viæ*: a venereal or scorbutic taint are also among the internal causes of inflammation in wounds; they affect those of long standing oftener than such as are recent.

The inflammatory complication of wounds manifests itself by swelling, redness, heat, and pain in its sides and the adjacent parts. When the inflammation runs high, it produces fever, watchfulness, and sometimes delirium. In incised wounds, the inflammation is generally confined to the lips of the wound; but in contused, deep-seated, or punctured wounds, which have penetrated far, the swelling extends to a great distance, and sometimes affects a whole limb. In this case, if the inflammation be intense, it not unfrequently produces large abscesses, and even gangrene.

As the inflammatory swelling, which is complicated with wounds, prevents their cure, we must combat it by all possible means. Bleeding, perhaps, may be justified in the early stages; but it usually answers better to put the patient upon very low diet, to dress the wound with soothing applications, and to apply gentle repellent remedies to the neighbouring parts.

When the inflammation has come on, we must ascertain if it depend upon an external cause, or upon the general inflammatory diathesis. In the former case, the external cause must be removed as far as is practicable, and fomentations, or emollient anodyne poultices, are to be applied; they promote suppuration, and the cleansing of the wound. In the

latter ease one or more bleedings should be prescribed, together with low diet and cooling drinks. In all cases we are to pay attention to the state of the primæ viæ; and when there are evident symptoms of derangement of the first passages, a vomit must be directed, and afterwards some gentle laxatives for several days.

The inflammation of wounds always terminates in copious suppuration; that of the surrounding parts, however, is resolved. Gangrene very rarely takes place; if it do, it must be treated according to the rules already laid down.

When much inflammation affects a wound, the sides of which have been put together, with a view to heal it by the first intention, it is necessary to remove the dressing; for, by keeping the lips in contact, we should increase the inflammation. Suppuration then is unavoidable. When it has taken place, and the sides of the wound are covered with granulations, we may again bring them into coaptation: for this purpose, sticking-plasters are admirably adapted. Thus we shall accelerate the cure of the wound, and diminish the size of the cicatrix,—an advantage not to be neglected, when the wound is on the face, or other part habitually exposed.

Of Tetanus.

Of all the complications of wounds, that from tetanus is the most dangerous. The term tetanus is applied to a permanent, violent, spasmodic contraction of the muscles of the jaws and trunk, which extends also, in some degree, to all the voluntary muscles.

Tetanus, caused by wounds, is called traumatic; but from whatever cause it may arise, it receives different names, according to the part which it affects.

Thus it is called trismus when it is confined to the elevator muscles of the lower jaw, which then are drawn with so much violence against the upper jaw, that no force can separate them; of course the patient is unable to swallow.

Tetanus is called tonie when the spasmodic contraction extends to all the muscles, and the body, from head to foot, is so straight and stiff, that when the heels of the patient are raised, the occiput alone touches the bed, as if he were a statue.

When the spasmodic contraction affects chiefly the posterior parts of the head, neck, and body, and those parts are bent in an arch backward, the tetanus is called the opistho-

tonos: if the body be inclined forward, and the chin touch the chest, the disease is then termed *emprostotonos*. These tetanic affections do not constitute different diseases, but only different varieties of the same disease.

Tetanus occurs in all climates; but especially in those of the torrid zone, and in the hot seasons. It is more common in marshy and maritime places than in those which are dry, elevated, and at a distance from the sea. Infants, a few days after birth, and middle aged persons, are more subject to trismus than those who are young or old. Men are more liable to it than women; the strong more than the feeble.

As to that which has been called traumatic tetanus, of which alone we shall treat at present, it comes on after a wound, with a frequency proportioned to the force of the exciting causes which exist in the places where the disease occurs, the strength of the patient, &c. But it is remarked, that it takes place more immediately after wounds of the extremities, than those of the neck and head. It sometimes appears immediately after the wound; but generally not until several days afterward: sometimes, even when the wound is quite well, and there remains neither pain nor uneasiness in the cicatrix.

The causes of traumatic tetanus are, contusions, punctures, ligature of a nerve, gun-shot wounds, wounds from the bite of animals. I saw an example of this sort in a man at Auteuil, who was bitten by a horse, and who died on the fourth day after the accident. Tetanus also frequently follows wounds of the ginglymoid joints, with tearing of the tendons, the ligaments, comminutive or complicated fracture, luxations, deep puncture in the sole of the foot, &c.

It seems probable, that the causes which produce tetanus act by exciting in the nerves of the injured part a particular irritation, which is communicated throughout the whole nervous system. But other causes are capable of producing this disease, or, at least, of favouring its developement in wounded persons, and whose mode of action is certain. Such, for example, are the suppression of perspiration by cold, wind, moisture, the sudden passage from hot to cold, the presence of worms, or other irritating aerid substances in the intestines, obstinate constipation, the repelling of a cutaneous disease, the suppression of an habitual evacuation, lively or sad emotions of the soul, the pleasures of love, &c.

Observation has made known the causes of tetanus, and

the circumstances which favour the developement of this dreadful disease; but hitherto it has taught us nothing of the manner in which they produce it. There is no morbid affection in the nosology of which we are so little acquainted as that of tetanus. Dissection of the body, which teaches us so much in most other diseases, discovers nothing relative to this, not even when the efficient cause is known.

Traumatic tetanus sometimes comes on very suddenly, and reaches its utmost violence in a short time; but more commonly it appears gradually, and attains slowly its acmé. In this case, it begins with a sense of stiffness about the nape of the neck, which increases by degrees, and renders motion of the head very difficult and painful. As the rigidity augments, the patient feels an uneasy sensation towards the root of the tongue, which soon changes to difficulty of swallowing. This increases, and finally deglutition becomes impossible. At the lower part of the chest a pain appears at the same time, which extends to the back. As soon as this pain is perceived, the spasm of all the muscles of the neck becomes very violent, and the head is drawn backward or forward, according as the contraction is stronger in the posterior or anterior muscles; but commonly it is thrown backward. At the same time, the elevator muscles of the face, which from the beginning were stiff, become violently contracted, so that no effort can separate the jaws. This state, which has been regarded as a particular disease, and which has been called trismus, or locked-jaw, may be considered as a pathognomic symptom of tetanus, which, in many cases consists in the state of the jaw alone. The abdominal muscles are acutely affected with spasm, so that the lower belly, drawn forcibly backward, is as hard and tense as a board. There are cases of tetanus affecting one side of the body only, and that to a great extent. Sauvâge has called this *lateral tetanus*.

When the disease is very violent, and the flexor muscles of the head and trunk contract so strongly as to balance the force of the extensor muscles, they keep the parts straight, tense, and stiff, so that they cannot be moved in any direction. To this state the name of tetanus is strictly applicable. The muscles of the inferior extremities become stiff also. The arms, which, until then, had been little affected, participate in the general stiffness, and become immoveable, excepting the fingers, which preserve their mobility to the last. The tongue also remains long un-

affected; but at last it is convulsed and pushed forcibly against the teeth.

In the highest degree of the disease, all the muscles of voluntary motion become affected, and, among others, those of the face. The brow is knit, the eyes are sometimes crossed, but commonly they remain fixed in their orbits; the nose is turned back, and the cheeks are drawn towards the ears, so that the countenance undergoes strange alterations. After this a violent convulsion soon appears, and puts an end to the existence of the patient.

Tetanic contractions, in whatever part they take place, are always attended with severe pain. Sometimes they continue without remission until the end of the disease; but generally their violence, and that of the pain, diminish after one or two minutes; but the relaxation is never sufficient for the muscles to yield to the action of their antagonists, and after ten or twelve minutes it is almost always followed by a return of the spasm and the pain. This return takes place without evident cause; but it frequently appears to be brought on by the efforts of the patient to change his position, to swallow, to speak, &c.

When tetanus is violent and general, the pulse is precipitate and irregular, the respiration is frequent and laborious; but during the remissions, both are natural: the heat of the body is not usually increased. In most patients the countenance is pale, and covered with a cold sweat: the limbs are often equally cold, and a sweat of the same kind is extended over the whole body.

In this disease there is rarely delirium, or even confusion of ideas, except in the last period. Sometimes there is vomiting from the beginning to the end; but generally it ceases in the course of the disease. The appetite lasts throughout the whole disease; and if the patient take food, it seems to be well digested. The urine is often retained, or discharged with difficulty and pain. The bowels are costive but it is not known if this symptom arise from the disease itself, or from the large doses of opium that are given to check it. The same may be said of the miliary eruption, which sometimes appears on the skin of persons affected with tetanus. It has not been observed, that this eruption was either favourable or otherwise; or that it produced any change in the course of the disease.

Tetanus is rarely attended with febrile symptoms; but when the spasms are violent and frequent, the pulse is more full and frequent than natural; the face is flushed, and all

the body is covered with a hot sweat. In tetanus produced by cold, fever sometimes arises, and it has been said to be attended with inflammatory symptoms; but when bleeding has been employed, the blood has shown no inflammatory coat.

Tetanus is generally a very intractable and dangerous disease. Experience has shown that when it results from the wound of a nerve, it is more violent, and more frequently fatal, than when it is the effect of the cold. Tetanus is also more or less dangerous according to the rapidity of its progress. That which comes on suddenly, and soonest attains its utmost violence, generally proves fatal before the fourth day. When this time is passed, the patient is in much less danger; for it may be observed, that the longer tetanus lasts, the less it is to be dreaded: but it nevertheless continues to be dangerous after the fourth day; and though its violence be much diminished at that time, it is liable to return in all its former severity and danger. When tetanus does not prove fatal, it does not terminate suddenly, or in a manner that can be regarded as critical, but it subsides by degrees, and all the symptoms do not disappear until after a very long time.

Tetanus is of the number of diseases, the treatment of which has not as yet been regulated by any fixed rules. A great variety of remedies, internal and external, have been used.

Opium promised most benefit in tetanus, and it has been used with advantage; but experience has taught us, that to produce a good effect, it must be given in very large doses, such as would be dangerous in other cases. Thus it is given in a dose of two or three grains every two or three hours, and even every hour in violent cases. In giving opium in this way, thirty or forty grains have been often taken with good effect in the course of twenty-four hours. It produces a marked remission of the spasm and pain, without causing sleep, delirium, or the other narcotic effects it occasions in other circumstances: hence the doses of it may be increased, in tetanic affections, as far as the symptoms seem to require; Chalmers repeated it until the spasm below the sternum diminished, the contractions disappeared, and the pulse became soft, full, and equal, and the body was covered with moisture.

The first remission of the symptoms must not lead us to leave off the opium; for as its effects do not continue long, the symptoms would resume their former violence, if new doses were not given before the former had ceased to act.

Opium must be given while the symptoms show any disposition to return ; and it is only when the advantage derived from it is very great, and has lasted some time, that we may begin to diminish the doses, and to give them at longer intervals.

The contraction of the jaws, and the impossibility of swallowing, which accompany tetanus, are obstacles to the administration of opium : hence we should have recourse to it in the first moments of the disease, and before the deglutition is impeded. When swallowing is no longer possible, we should give opiate injections, in doses proportioned to the violence of the disease ; it is also proper to place between the patient's teeth, before the jaws are locked, a kind of gag, made of wood covered with linen : without this precaution, the patient would often be unable to swallow any thing from the beginning of the disease.

The constipation which accompanies tetanus, and which probably arises from a spasm of the intestines, is augmented by the strong doses of opium which are usually given. As this constipation may aggravate the disease, it should be combated by laxatives while deglutition is possible, and by injections afterwards.*

It has been judged from analogy, that the action of opium might be much increased, by uniting to it other antispasmodics. These remedies have also been laid aside. Musk has been regarded by some practitioners as the surest remedy ; but, either from the imbecility of the musk, or the insufficiency of the doses, success does not seem to have attended its use ; and as in most of the cases which have done well after the use of this remedy, opium was given at the same time, it is impossible to say what share the musk has had in producing the cure. If musk or camphor be employed, they should be given in very large doses.

As tetanus sometimes terminates with fever and copious sweats, it has been thought, that every thing that could tend to excite them would be proper. In this view, sudorifics, and especially ammonia, have been administered with success by several practitioners. Given in a dose of eight or ten drops in sugar and water, or with a sudorific draught, it excites copious sweats, which have sometimes produced a remission of the spasm, and a final cure of the disease.

Besides the internal remedies, which the locked state of the jaws and the difficulty of swallowing do not always allow us to administer, there are some external means which may be very properly employed.

* See note II. ✓

Practitioners differ as to the utility of bleeding. It may be proper, when the patient is young and plethoric, when there is fever, or when the disease has been preceded or attended with a general evacuation, which has stopped. If the patient have been subject to hemorrhoids, leeches should be applied to the margin of the anus. In other cases, bleeding is improper.

The warm bath appears very well calculated to relax the spasms of tetanus, and it is often employed in the treatment of this disease. Bajon, who saw many cases of it in Cayenne, seems to place his chief dependence upon this remedy. Chalmers began by bleeding when the patient was plethoric, and afterwards put him into the warm bath, which, he observed, was almost the only means of restoring the power of deglutition; but he confesses that it is not always successful, and moreover, it is said to have been injurious in some cases, and even to have occasioned death. But it is difficult to say whether we should attribute this result to the bath, or the motion to which it was necessary to subject the patient in employing it, as we know motion of every kind brings on the spasms, and renders them more severe. I have often employed the warm bath in the treatment of tetanic patients, and although their utility was not very striking. I have not observed them to do harm, when proper precautions were taken to move the patient very gently. Sometimes bathing the feet and legs may be employed without stirring the patient, and with advantage.

Authors are not agreed as to the utility of the cold bath; some have considered it very efficacious, others say it is not at all so. Barrere, an old physician of Cayenne, says he has employed, with success, affusion of cold water, and the cold bath, in the tetanus of infants: he sprinkled them several times, as soon as they left the breast, with cold water, until the parts had recovered their natural suppleness. He assures us, that the negro women employ this method with great advantage: they plunge their children into cold water the moment they see the disease making its appearance, and they commonly cure them. But Bajon, who also practised at Cayenne, declares that this treatment never succeeds. It is probable that this difference of opinion has arisen from the employment of the cold bath under different circumstances.

Mr. Wright has inserted in the sixth volume of the *Researches and Observations of the Medical Society of London*, a memoir, which contains an account of the first trials that were made of the cold bath in the treatment of tetanus.

nus, and which were successful. At present, this remedy is in very general use in the West-Indies, where tetanus is very common. It is sometimes administered by plunging the patient into cold water—into sea-water rather than any other, or more commonly by pouring it on different parts, or over the whole body; the patient is then put in blankets, and takes a strong dose of opium. This operation is repeated at the expiration of several hours. After repeating several times the bath, &c. the patient no longer requires immersion, and at last is completely cured, and sometimes very speedily. In some cases, besides this treatment, wine and tincture of bark have been given, and have seemed to produce good effect; the use of ammonia might also be added, in doses of ten or twelve drops, in a glass of sugar and water, or a sudorific draught. The cold bath has been rarely employed in traumatic tetanus: it has chiefly been used in those cases which have appeared to be caused by cold air. Hippocrates recommends the cold bath in tetanus, but limits the application of it to patients who are young and vigorous, to hot seasons, and forbids it when the disease arises from a wound. We find in the work of M. Heurteloup, entitled, *An Essay on the Tetanus of Adults*, a case which is contrary to the opinion of the Father of medicine; inasmuch as it proves that the cold bath may be employed with success in traumatic tetanus, especially when it has made rapid progress. Nevertheless, as cases of this kind are extremely rare, we should use this remedy in traumatic tetanus with great caution, until further experience has decided as to its effects.

Mercury has been used in tetanus, and sometimes with success. Frictions with mercurial ointment are made on the upper parts, especially the arms and neck, even to the extent of two or three ounces at a single friction, in order to excite a speedy salivation. Mercury has also been given internally; but under whatever form it is used, it must be given early, and in large doses, so as to excite salivation; taking care, however, that it does not affect the mouth too severely. With mercury is generally combined the use of opium, the bath, laxatives, diluents, &c. and these remedies together have had success. The administration of mercury should be continued until the disease is entirely subdued, unless particular circumstances oblige us to suspend its use.

M. Heurteloup has reported, in the work above cited, a very conclusive case in favour of mercury, without any other auxiliary. A soldier was affected with tetanus eight days after amputation of his leg; his jaws were locked, and he

could swallow nothing. Salivation was excited, by dressing the wound with lint spread over thickly with strong mercurial ointment. The patient recovered.

Large blisters have been applied to the nape of the neck, and between the shoulders ; but as they are rarely useful, and often injurious, they are now generally abandoned. However, if the disease have arisen from a repelled eruption, blisters might be serviceable.

The ancients often used baths of warm oil ; they applied bladders filled with warm milk about the neck and jaws, and made embrocations to the parts affected. These remedies have been neglected by the moderns, and are now almost forgotten ; nevertheless, they can occasion little inconvenience, and I think we ought to have recourse to them as auxiliaries.

Ambrose Paré cured a traumatic tetanus, by covering the patient with dung, after having rubbed his body with liniment. This celebrated surgeon had amputated a soldier's arm at the elbow-joint ; tetanus came on, as Paré had predicted, because the patient slept in a corn-loft, where he was exposed to cold ; Paré had him carried to a stable, where there was a large dung-heap ; he was put between two chafing-dishes filled with coals ; his neck, arms, and legs were rubbed with an antispasmodic liniment ; he was then wrapped in a warm blanket, and put on a dung-heap, covered with fresh straw ; manure was then thrown over him, until he was covered, except his head. He remained in this position three days and nights ; a diarrhœa and copious sweat came on, the spasm diminished, and he got well.*

The means of which we have hitherto spoken, are applicable to the treatment of all kinds of tetanus ; but when this disease arises in consequence of a wound, there are other remedies to be applied to the wound itself. It has been advised to amputate the wounded part when it is practicable, or at least to destroy the communication which exists between it and the brain, either by dividing the nerve with a cutting instrument, or deadening a portion of it with caustic, or the actual cautery. These remedies might perhaps prevent tetanus, if they were resorted to early, and before the appearance of the first symptoms ; but when the disease has appeared, and especially when the spasms have become general, they are of no use. The same observations may be applied to the extraction of foreign bodies, and of unbridling the wound when it is confined, contused, and

* *Œuvres d'Ambroise Paré*, liv. xii. ch. 37.

greatly swollen. When the wound is painful, inflamed, and swollen, emollients and cataplasms are to be applied in the form of poultices and fomentations, if it be dry, the flesh sunk in, and suppuration totally suppressed. Some practitioners apply a blister, or mix cantharides in the dressings, to induce suppuration, and these means have produced good effects.

Such are the principal remedies which have been employed in tetanus; those which have been administered with the most success, and upon the efficacy of which we ought most to reckon in the treatment of tetanus, are opium, musk, camphor, ammonia, mercury, and baths. In the choice and combinations of these remedies, we ought to consider the cause of the disease, the violence of the symptoms, the temperature of the climate, &c. moreover, it is proper to observe, that whatever method we may select, after an attentive examination of the circumstances which have been pointed out, we ought to follow it with spirit and perseverance, rather than abandon it lightly for another, because its effects do not appear immediately. This instability of practice is calculated only to augment the evil, and to render of no avail the best indicated means.

A disease so severe as traumatic tetanus, must necessarily have excited the attention of surgeons in modern days, in which they have had to treat a great number of gun-shot wounds—injuries which are often followed by this disease. Several practitioners have published their observations upon it. M. Fournier, doctor of medicine and surgery at Brussels, who has practised surgery with credit in military hospitals, has published five cases of traumatic tetanus cured by the method which we shall explain by a detail of his cases.

CASE I. In the month of October, a soldier wounded in the articulation of the elbow by a ball, which produced considerable disorder, was exposed for several days, to the effect of cold and moisture, during his transportation to the hospital of Brussels. At his arrival, M. Fournier enlarged the wound, which had been made twelve days before, and which had not been dilated: he extracted several scales, pieces of cloth, and splinters; nevertheless, in the evening tetanus appeared, with full pulse, laborious respiration, and constipation: bleeding, warm bath, plentiful drink of the arnica, in each glass of which were put six drops of the eau-de-luce, were prescribed. The following day there was tetanic stiffness, with tense abdomen, &c. Copious bleeding, warm bath, arnica in his drink, with the addition, every hour, of four grains of musk, and as much camphor and

purified nitre were ordered. In the evening no melioration of the symptoms, the bleeding, bath, enemata, and eau-de-luce, taken with arnica, were prescribed, and increased to eight drops, the musk and camphor to five grains, and the nitre to ten, on account of the total suppression of urine; a piece of wood, which had been placed between the teeth, could now be removed. At length the patient could stand, and was finally cured. The doses of the remedies were diminished very gradually before they were finally stopped; nevertheless, the patient could not speak with perfect ease till the end of eighteen days.

CASE II. A volunteer, aged thirty-six years, was wounded in the month of February, in the year 1795, by a ball, which fractured one of the bones of the cheek: he slept in a hall exposed to the north, extremely moist, and paved with blue stones; besides this, he walked in the anti-chamber, without regard to the inclemency of the weather; but having one evening continued walking very late, he became cold, and returned to bed trembling: on the following day tetanus appeared, attended with trismus, tension of the muscles of the face and neck: the wound was probed, a ball and large splinter were extracted, the patient was then placed in a convenient situation, treated like the other, and with the same success, but he was not bled, on account of his melancholic state: a crisis took place by copious sweats, as in the former case, but they lasted much longer, and even beyond the time of cure.

CASE III. In the month of July, 1796, a prisoner of war, aged twenty, received a wound which broke the condyles of the femur and the patella: he remained during a night on a wet pavement, covered only with straw; was seized the next day with general tetanus; pulse intermittent, feeble, and the body cold, but the face animated and burning: the patient was taken to a dry and warm room, and, except bleeding and baths, (which his feeble state did not allow, and a blister, which was applied to the back of his neck, on account of the flushing and convulsive state of the face), the treatment was exactly the same as in the two preceding cases. The crisis took place by sweat, and the success was so prompt and complete, that the seventh day from the appearance of this disease, and the tenth after the wound, amputation of the thigh was performed, without any return of the disease.

CASE IV. M. Frank received the charge of a fowling-piece in the sole of his left foot, and his wound having been neglected, was affected with tetanus at the end of five

days. The wound and the neighbouring abscess were opened; the pulse was locked and frequent; he was copiously bled, but his skin not being rigid, the bath was omitted; in other respects the same treatment was pursued as in the preceding cases; his sweats were equally great; on the eighteenth day he was so well that no other remedies were used.

CASE V. A man, by the name of Vaetenberg, having drank wine and strong beer to excess, the sixth day after the operation for a very large sarcocele, experienced a hemorrhage during the night, by which he lost much blood, so that it became necessary to tie the whole spermatic cord; notwithstanding this, the wound healed the twenty-second day, with the exception of the place where the ligature was applied; on that day Vaetenberg having gone out in cold and windy weather, was seized with the first symptoms of tetanus; the ligature was cut, and compresses of opium applied to the wound. The pulse, though quick, being small, the patient was not bled; his skin was rigid and dry; but as there was no convenience for a bath, six drops eau-de-luce, and an infusion of arnica, camphor, and musk, were given in doses of three grains each, every two hours: in the evening he was more sensible, and, during the night, calm; the next morning he sweated copiously: in eight days he was cured, but musk was continued in doses of six grains every evening until the complete cicatrization of the wound.

In all the cases which have been cited except this last, besides the means which have been pointed out, he used an ointment, composed of equal parts of mercury and bas-silicon, with a large proportion of the powder of cantharides, with a view to excite copious suppuration, and thus to relieve the dried fibres of the wound.

Dr. Stutz has also added to his memoir several cases, communicated to him by M. Francis Fournier, ex-surgeon of the Marine; to wit, three upon a particular convulsive disease called *cramp*, and which, though more fatal than tetanus, yielded to the internal use of ammonia in a plentiful drink of a decoction of canella; three others of very violent convulsions, which yielded to the same remedy; and, lastly, two cases of traumatic tetanus, of which the following are abstracts, cured in this way.

CASE I. A sailor, wounded in the foot, was the next day seized with tetanus. Volatile alkali, in doses of twelve drops, assisted by the plentiful use of a decoction of canella, with a view to excite perspiration, entirely cured the tetanic symptoms.

CASE II. A negro woman, twenty-three years old, was

pricked very deeply in the sole of the foot, by a thorn of the prickly-pear, and seized with tetanus the second day after the wound. Twelve drops of volatile alkali being given without effect, a second and third dose were administered; perspiration then commenced, and the patient was cured in a few days.

Doctor M. A. Stutz, first physician of the city of Gmund, in Suabia, published, in 1800, *Observations upon a new and sure Mode of curing Traumatic Tetanus*.* This consists of alkaline baths, and the carbonate of potash, united with opium.

Doctor Stutz has supported the efficacy of these means by three remarkable cases, of which we shall give an abstract.

CASE I. A soldier, aged twenty-five years, wounded by a ball at the joint of the foot, was affected with tetanus twelve days after the accident: the wound was dilated, and antispasmodics of every kind given in very large doses; anodyne liniments, enemata, musk, opium, and mercurial frictions were employed to the seventeenth day of the disease, without arresting its progress, so that the patient was nearly expiring. The author having reflected upon the alternate effects of opium and alkalies to diminish the nervous and muscular irritability, placed the patient in a hot bath, made with lye, in which was dissolved two ounces of caustic potash, and gave him, by spoonfuls, every two hours, a draught made with a drachm of the carbonate of potash in six ounces of distilled water, with the addition of half an ounce of syrup.

Opium, which had been at first used to the extent of thirty-four grains in twenty-four hours, was now reduced to ten, and the friction was discontinued. As soon as the patient was put into a bath, he appeared to revive, and the symptoms visibly subsided; the draught produced a no less striking effect; copious sweats took place; nevertheless, the alkali taken internally was used to the extent of four scruples, and even to that of a drachm and a half, while the opium was given only in a dose of one grain at night; afterwards the doses of the alkali were diminished, and at length relinquished.

CASE II. A soldier, wounded by a ball in the internal part of the arm, was attacked by tetanus, after five days trans-

* See the *Medico-Chirurgical Gazette of Hartenstein*, at Saltzbourg, for the year 1800, vol. i. and the *Bibliothèque Germanique Medico-Chirurgicale*, vol. vi. page 127.

portation in bad weather. An alkaline bath was administered, and alkalies were given internally, from the commencement of the disease, without any success at first. Mercurial frictions were united with these means; but, as in the preceding case, mercury was discontinued before it had acted on the system: notwithstanding this, on the fifth day, the dose of alkali being increased to a drachm and a half, and opium to twelve grains, in twenty-four hours, a sweat began to pour from every part of the patient's body, to an extreme degree; but before a complete crisis, and sensible improvements were produced, (which took place on the eleventh day,) two drachms of alkali, and eighteen grains of opium, were given in twenty-four hours, and the bath was repeated; injections of soap and water were also very useful, by producing alvine evacuations. The doses of the remedies were diminished on the eighteenth day, and discontinued on the twenty-second. In this case a miliary eruption took place on the back.

CASE III. A soldier, aged twenty-six years, wounded in the shoulder by a ball, was seized with tetanus twenty-three days after the accident. He was readily cured by the above mentioned means. The largest quantity of alkali given in this case, in twenty-four hours, was four scruples, and of opium six grains: an ounce only at first, and afterwards an ounce and a half of caustic potash were put into the bath. All remedies were discontinued on the eighteenth day.

As to my own experience, I have twice followed Dr. Stutz's method for the cure of traumatic tetanus, but less happily than him; for although I neglected nothing that he recommends, my patients died.

Of Palsy.

We shall not here speak of palsy arising from an organic affection of the brain, but of that only which is consequent to a wound of a nerve. The existence of palsy is ascertained not only by the loss of sensation and motion of the part, but by the situation and depth of the wound. Thus, if a person receive a sabre wound on the lower and outer part of the arm, extending to the bone, at the part where the radial nerve turns around the humerus, an intelligent surgeon will predict, that the extensor muscles of the hands and fingers can no longer contract. The cubital nerve has been divided between the internal tuberosity of the humerus and the olecranon, and deprived the last fingers of their sense of feeling, while they retained the power of moving.

because the muscles which give motion to the fingers receive their nerves from a different source.

We are not to confound palsy with the temporary loss of power in a muscle to move the parts to which it is attached, arising from a division of the muscle itself, or of its tendon. For example, when the tendo achillis has been cut across, the muscles which are attached to it can no longer extend the foot; but this loss of motion ceases when the two ends of the divided tendon adhere to each other, while the action of muscles, paralyzed by a division of the nerves, is never restored.*

Although we cannot remedy the palsy of which we are speaking, it is important to foresee it before the cure of the wound; for if the surgeon did not warn his patient, that the loss of motion which he had sustained is incurable, he might attribute it to the manner in which the wound was treated.

SECTION II. *Of the Secondary Consequences of Wounds.*

The secondary consequences of wounds, are the stagnation of pus, suppression of suppuration, and hospital gangrene.

Of the Stagnation of Pus.

In general, the quantity of pus is proportioned to the extent of the surface of the wound; an experienced eye readily judges of the quantity which ought to be secreted by a wound. When a wound furnishes, in the intervals of dressing, a greater quantity of pus than might be expected from its apparent extent, and when pressure upon the neighbouring parts produces a still further discharge of purulent matter, it is an evidence of the stagnation of pus, that is to say, of a concealed abscess, which furnishes this plentiful suppuration. The stagnation of pus takes place in comminutive fractures, whether produced by ordinary violence or cannon-balls. In these cases, on pressing the limb in different parts of its surface, we see pus proceeding from the opening which communicates with the abscess. The passage to the abscess is ascertained by introducing a probe, which also makes us acquainted with its extent, its depth, and the relation of its bottom with its aperture. The burrowing of pus may also take place in another manner, when the wound is large and deep, and the interior part is lower than the

* See note I.

external. In this case, all the pus which flows in the intervals of dressing, not being absorbed by the lint, collects at the bottom. The pus which thus accumulates in the wound, the bottom of which is open, is not very liable to become vitiated, even when very plentiful; but that which collects in a concealed cavity, and stagnates there, soon becomes corrupted, in a manner which we shall presently mention.

To prevent pus from accumulating at the bottom of a wound, it is in general sufficient to place the part in a position which favours its escape; but when, from the situation of the wound, this is impracticable, it must be dressed frequently, and, at each dressing, the pus which is on the bottom of the wound, must be soaked up with fine lint. I have been obliged to dress three times in twenty-four hours, an enormous wound, resulting from an operation for false consecutive aneurism of the femoral artery, and to absorb with lint, at each dressing, a great quantity of pus. As the suppuration diminishes, the time between the dressings must be increased; it would be alike injurious then to dress the wound too frequently, as in cases where the suppuration is copious, to suffer the intervals to be too long. But when the pus collects in a particular cavity, communicating with the wound by a narrow opening, suitable position of the part, and frequent dressing, are rarely sufficient to prevent it from stagnating. In this case, it is almost always necessary to enlarge the opening of the cavity in which the pus stagnates, to allow its free exit, and to dress with lint the part where it collects. There are some cases in which it is better, in place of enlarging the communication between the wound and the purulent cavity, to cut into it externally. This incision, which is called *counter-opening*, ought to be large, to give free vent to the pus, and to permit, if necessary, the passage of a dossil of lint, to absorb and discharge the matter. The enlargement of the opening of the cavity in which the purulent matter collects, and the formation of a counter-opening at the most depending part, are the most common and effectual means to prevent the stagnation of pus; but they are not always practicable; and in this case we are to have recourse to expulsive bandages, injections, &c.

When all these means are insufficient, or when they have been neglected, the presence of pus produces different effects, according as it has been accumulated only in the intervals of dressing, or remains for some time in a concealed cavity, which communicates with the wound by a narrow opening, and never completely empties itself.

In the first case, the pus is seldom much vitiated, but its presence keeps the granulations in a state of relaxation and softness, unfavourable to the draining of the parts and the diminution of the wound.

In the second case, the pus increases in quantity, destroys the fat, and forms cavities or sinuses, produces indurations, callosities, and sometimes an edematous swelling of the affected parts; but of all the effects of the stagnation of pus in the cases of which we speak, its vitiation is the most remarkable and serious.

As long as well-conditioned pus is not exposed too long to the impression of air, it contracts no injurious qualities, and may be absorbed by the lymphatics, without producing any disturbance in the animal economy; but when it remains long exposed to the contact of air, it becomes corrupted, and acquires injurious qualities, which are manifested by its fetor, and the irritation it produces in the parts with which it is in contact. In this state, its absorption is usually attended with fever, colliquative sweats, diarrhœa, abscesses, debility, and marasmus, which, if they continue, soon prove fatal. The absorption of vitiated pus is to be remedied only by preventing it from stagnating by the means we have pointed out; and when the absorption cannot be prevented, its effects are to be combated by bark and generous diet.

Of the Suppression of Suppuration.

A suppression of suppuration is said to take place when a wound, whose appearance is red and granulated, and which furnishes laudable pus, suddenly becomes dry, inflamed, pale, bloated, without action, and furnishing no pus. This state has been called *reflux of suppuration*, because it was thought that pus continued to be formed in the vessels, but flowed back into the circulating mass, producing different diseases, and sometimes even the death of the patient.

The suppression of suppuration may take place at any period of a wound, but it most commonly happens when they are far advanced towards a cure. The symptoms which follow it are, fever, irregular chills, weak and contracted pulse, cold sweats, anxiety, oppression, sinking, sometimes even convulsions, delirium, lethargy, a dryness and inflammatory disposition in the granulations of the wound, or a want of action approaching to mortification.

These symptoms, which have been attributed to the suppression of suppuration, seem rather to be the cause of it; in fact, how can we conceive that healthy pus, while it is

yet contained in the vessels which form it, by flowing back into the animal economy, can give rise to symptoms so serious as those which commonly attend the suppression of suppuration, and still less produce internal abscesses? Moreover, we sometimes find, in those who die two or three days after the suppression of suppuration, these internal abscesses, which form in the liver, lungs, mesentery, or brain, which can be produced only by a previous inflammation, occasioned by some irritating cause.

These abscesses, which, without doubt, are the cause of the death of the patient, must of course produce a suppression of suppuration, and the symptoms which follow it; and we mistake the cause for the effect, if we attribute them to the absorption of pus; for these abscesses, which are not usually discovered until after the death of the patient, take place so insensibly, that we are ignorant of the time of their formation.

The suppression of suppuration is sometimes produced by the sudden appearance of idiopathic fever in a person whose wound is freely suppurating. The moment the fever appears, the wound becomes dry, inflammation is almost extinguished, and the suppuration does not return until the disease which has occasioned its suppression is in the way of cure. In general, the suppression of suppuration is not of itself dangerous; it rather renders the wound stationary, than produces alarming symptoms.

Internal abscesses and fever are not the only causes of the suppression of suppuration; they arise also from the irritation of the wound by a foreign body, by cold air, by rough and unskilful dressing, and by the use of active and irritating applications. This irritation excites, in the granulations of the wound, an inflammatory disposition, which interrupts suppuration. The faults which patients commit in regimen, and violent passions, often produce the same effect, with other symptoms; such as fever, delirium, syncope, and convulsions, which are more to be feared than the suppression of suppuration, which is always the least dangerous accident.

There is no remedy for the suppression of suppuration caused by an abscess of any of the viscera; we can only endeavour to prevent the abscess, when there is any appearance of its formation; but, in general, we are only made aware of its existence by fatal symptoms. These precautions are different, according to the state of the wound, from the symptoms of the patient. If the wound furnish laudable pus, and the patient suddenly experience pain in any viscus,

and fever should come on, we must have recourse to bleeding, and other antiphlogistic means, calculated to prevent suppuration of the inflamed viscus.

When the suppression of suppuration is caused by an inflammatory disposition of the granulations, brought on by any irritation whatever, we must remove the irritating cause, and reduce the inflammation by topical emollients. If the symptoms run high, and fever supervene, we must have recourse to bleeding and diluents. When the suppression has been occasioned by improper regimen, the case is most serious; it must be treated with extremely low diet, by injections, and gentle purges. If suppuration have been interrupted by violent passions, and be accompanied with serious symptoms, we should endeavour to moderate them, and to re-establish the suppuration by emollient tonics; but they are often so pressing, that we have not time to relieve them.

Of Hospital Gangrene.

This is a kind of wet gangrene, which affects, in a manner epidemically, every wound in a crowded hospital.

Its occasional causes are, the situation of the hospital in low marshy ground, the vicinity of sinks, the filth of personal uncleanness, unwholesome food, crowded and unventilated wards, in fact, every thing which destroys the purity of the air of the place where patients are collected; for air thus infected, brings on this disease, even in the most simple wounds, by its effect not only on the surface of the wound itself, but also on the whole system. Thus causes of this kind sometimes produce very dreadful and long-continued gangrenous epidemics, in which every wound assumes an unhealthy appearance, and is often affected with the worst symptoms of hospital gangrene. M. Vigaroux saw an epidemic of this kind which lasted twenty months, in two hospitals at Montpellier; and he declares that the most powerful antiseptics were a feeble resource against the disease when it affected even the slightest scratches.

In general, we do not perceive such epidemics in new hospitals, and in those which are built on high ground in the country. Hospital gangrene may appear at any season, but most commonly shows itself after the heat of summer, and after long-continued southerly winds. It attacks indiscriminately all wounds; not every wound in one ward, but the majority of them, in different degrees; the largest wounds least frequently escape: sometimes it affects part

of a wound only, while the rest is doing well. Patients who have escaped it once, are not exempted from it afterwards.

Bilious and melancholic temperaments, chagrin, fear, and other depressing passions, unhealthy or insufficient food, the scorbutic diathesis, the weakening of the vital powers by any anterior circumstances whatsoever, idiopathic fevers, &c. are predisposing causes of this disease.

The observations of Pouteau, and those of other practitioners, prove, beyond doubt, that hospital gangrene may be communicated to a wound or a simple ulcer; to a person of the most healthy constitution, breathing the purest air, merely by the contact of linen, or lint, infected with the leaven of the disease. But this inoculation is the more to be dreaded, and is more speedy and certain in its effects, when patients have already been exposed to the influence of causes capable of producing the disease, and whose constitutions favour its developement; moreover, it is certain that a patient, who has received the germe of this disease in an hospital, cannot prevent it by any precaution whatever: we have seen it appear among wounded men, who fled from the epidemic to elevated situations, where the air was pure.

The first symptoms of hospital gangrene are, pain in the wound, and a white viscid coat on the surface of the granulations, which become paler, and present several greyish spots, resembling venereal ulcers, or apthæ. Commonly these points of ulcerations, in different parts of the primitive sore, extend and unite, so that the whole assumes a greyish ash colour, more or less hard, and sometimes bleeding; a purplish red colour next forms on the adjacent skin, which becomes edematous, and extends. Sometimes, when the patient is healthy, the disease goes no further—it may even affect only a part of the ulcer; but oftener its progress is extremely rapid and frightful; the edges of the wound become hard and everted; the granulations are raised and puffed up by the evolution of a large quantity of gas, with which they seem to be entirely filled; then they fall off by soft reddish eschars, very like the putrid brain of a fœtus; the surface of the ulcer becomes putrid, and furnishes an abundance of sanious pus, extremely fetid. Until it be arrested, it extends either in superficies or depth, so that aponeuroses, muscles, blood-vessels, nerves, tendons, periosteum, and the bones themselves, become its prey.

As soon as the disease has reached a certain height, the patient loses his appetite, the tongue is covered with a

white coat, and fever appears ; the pulse is small, hard, and irregular ; his agitation becomes general ; he is anxious, sleepless, and disturbed.

Hospital gangrene continues for a longer or a shorter time, according to the extent of the wound or ulcer which it affects, the temperament of the patient, the impression of the septic miasmata on the animal economy from the violence of the disease : there are examples of its having extended beyond the thirtieth day. In such instances, patients seldom recover ; in ordinary cases, the wound does not assume a healthy appearance until the sixth or ninth day ; in milder cases, improvement takes place on the third or fifth day. The cure of the disease, at whatever time it may take place, is preceded by a diminution of the pain ; the pus becomes white and consistent ; it loses its fetor and nauseous smell ; the edges of the ulcer sink, become less ragged, and more red ; the red purple edema which surrounds it, assumes a genuine inflammatory character, and the ulcer once more becomes simple, and soon closes, even though it had been previously large, unless something occur to interrupt the process of cicatrization. But sometimes, when the patient appears almost cured, his situation is suddenly changed : he suffers a relapse, which may occur several times.

Hospital gangrene is always an unfortunate complication of wounds, since it greatly retards their cure : however, in simple ulcers of small extent, and in patients of a good constitution, it is not a dangerous disease. After the separation of the eschar, the ulcer soon heals, and the cicatrix presents a very slight deformity ; but in solutions of continuity of a large extent or long standing, this disease makes great progress, often returns, and is difficult of cure. The same thing occurs to persons affected with any internal disease, as scurvy or syphilis ; and these cases are always dangerous ; but hospital gangrene is particularly dangerous, and almost uniformly fatal, in large contused wounds, with fracture of a bone. In such cases, we often see whole limbs deprived of their soft parts, and the unfortunate patients sink, sometimes under gangrenous fever, sometimes under the acute pain which accompanies the disease, or the frequent hemorrhages which they suffer ; but most commonly they die of marasmus, which inevitably follows long and copious suppuration.

The treatment of hospital gangrene is preventive and curative.

In the prophylactic treatment of this disease, we should

remove every cause which we think has given rise to it. Wards must not be crowded with the wounded; they must be, as much as possible, airy and insulated. On the other hand, we should prevent predisposition of the wounded to contract this disease, by well-selected aliments, by drinks strongly acidulated with a vegetable or mineral acid, and especially by a moderate use of generous wine. The state of the first passages demands particular attention, and upon the slightest appearance of saburra, we should have recourse to emetics and purges, and repeat them according to circumstances. The happy action of these remedies destroys the germe of bilious fever, so common to wounded persons, who have not been evacuated for a long time. After the use of evacnants, it is necessary to prescribe bitter and slightly aromatic drinks, to support the tone of the stomach, and to favour its functions. Dressings ought to be made very quickly, and with an extreme attention to cleanliness. We cannot use too much caution to prevent the inoculation of which we have spoken. In the treatment of wounds and ulcers threatened with hospital gangrene, we should never use fatty or resinous substances, but, on the contrary, employ those applications which support the strength of the granulations without irritating them. A simple infusion of aromatic plants in water, or in wine, or alkaline solutions, answer this purpose extremely well. The ulcers are to be washed with these preparations, and the dressings wet with them every twelve hours. The wound should be dressed only once in two or three days, unless it furnish a large quantity of pus.

Such are the means of which the judicious employment will either banish hospital gangrene from our wards, or render it rare. We shall now treat of the course to be pursued in the cure of this disease.

The surest mode of arresting its progress, or, at any rate, of abridging its duration, is undoubtedly to remove the patients to a more healthy place, and to separate them from an atmosphere infected with putrid and fetid miasmata, in which they have received the general disease: but this is often impracticable. Where, in fact, is the hospital, in which are well-aired wards of reserve, removed from every source of infection, and into which we might transport the wounded, on the first appearance of the disease? The best constructed hospitals are far from offering any such convenience; all we can do, therefore, is, to purify the air of our wards by proper ventilation, and by fumigation of oxi-muri-

atic acid, according to the advice and process of Guyton Morveau, or by the vapours of nitric acid.*

Moreover, when one or more patients occupy a confined part of the ward, or are near any particular source of infection, and become affected with the disease, they should be removed to that part of the room which is best ventilated, and as far as possible from the place where they contracted the disease.

Diet, internal and topical remedies, form the three next essential points in the treatment of hospital gangrene. When it is complicated with a wound or extensive ulcer, ptisan alone constitutes both drink and nourishment; or, at any rate, the patient should take nothing stronger than gruel; even broth would be liable to decomposition in the stomach. When the heat and irritation diminish, we may give gruel somewhat thicker; and afterwards, when the state of the patient allows of it, he may take fresh eggs, fruit, fish, and white meats; but the quantity of this should always be small in proportion to the other aliments: the less meat the patients eat, the less liable are they to a return of the disease.

When fever, irritation, and heat exist, we should prescribe diluting acidulating drinks, such as a solution of nitre in whey, lemonade, &c.; if there be indications of saburra in the first passages, an emetic must be given; if the patient be weak and languid, he should take some good old claret, either mixed with lemonade or pure, as the case may require. Bark, the antiseptic virtue of which has been so much boasted of, appears, in general, more injurious than useful in the disease of which we are treating; it has been

* To fumigate with oxi-muriatic acid a ward of ten beds:

Take, Muriate of soda	-	-	-	℥ iij.	℥ ij.	x. grs.
Black oxide of manganese	-	-	-	-	℥ v.	xvii. grs.
Water	-	-	-	℥ j.	℥ ij.	xxiii. grs.
Sulphuric acid	-	-	-	℥ j.	℥ vii.	l. grs.

The manganese and salt are to be rubbed together, and put in a porcelain or glass vessel; the water is to be added, and afterward the acid, provided there are no patients in the room, otherwise it must be added gradually. It is useless to employ heat, which would decompose too quickly the marine salt.

Fumigations of nitric acid are made, by adding to half an ounce of strong sulphuric acid, an equal quantity of powdered nitrate of potash, which produces, for an hour, a white vapour, that spreads about the room. According to Carmichael Smith, the quantities we have mentioned are sufficient for a room ten feet square.

In using either of these fumigations, we should repeat them once or twice a-day, until the entire disappearance of the disease: it is proper also to carry the vessel containing the materials to all parts of the room, and to close the windows.

observed, that its long-continued use in large doses, has proved fatal, by increasing the fever and irritation which almost always attend this kind of gangrene: nevertheless, under great debility, bark is indicated, and may be given with advantage. Experience has taught us, that the dry extract, or essential salt, is the best preparation of this medicine; it does not require the same digestive process as the bark in powder, and it has more action than the simple decoction: but, under whatever form we employ this remedy, it is never to be given before the fever and irritation have diminished, and the disease is on the decline.

Acids have not the inconveniences of bark; they are suited to all periods of the disease; their efficacy is established by a great number of applications, and their success is proportioned to the dose in which we administer them. The sulphuric acid has been most successful, but the acidulous tartrate of potash is equally good: the first is to be added to water, so as to make it as acid as it can be taken; the second is administered in doses, from two to four drachms in a day, to be taken at intervals, in water or tea.

As to the local treatment, almost every antiseptic medicine has been employed. M. Dussaussoy, after a great number of trials, prefers the powder of bark to all others: he advises that the wound should be covered with several layers of this powder, which is to be wet with spirits of turpentine, so as to form, as he expresses it, a kind of mason-work four or five lines (one-third of an inch) above the surface of the ulcer. When this dries, it forms a pliable crust, through which the pus is discharged. After twenty-four hours, this crust is to be removed, and replaced by a similar dressing. Four or five applications of this kind are generally sufficient for simple wounds. Where the disease does not extend beyond the skin and subcutaneous cellular tissue, healthy inflammation is quickly established, the eschars are separated, and the wound begins to heal.

But when, by the employment of this remedy, and those of which we have just spoken, we cannot arrest the progress of the gangrene, and it threatens to destroy all the neighbouring soft parts, we must not hesitate a moment to have recourse to the actual cautery, and to repeat its application until the whole surface of the putrid ulcer is converted into a hard solid crust; we must not spare even the edges—they must be torried and roasted. This crust is then to be covered with a thick coat of powdered bark which has been steeped in spirits of turpentine, and, at the end of twenty-four, thirty-six, or forty-eight hours, this is to be removed,

in order that we may judge, by the appearance of the flesh, and the quality of the pus, if it be necessary to have recourse to a second cauterization.

It has been proposed to substitute boiling oil for a red-hot iron : but this never extends its action deep enough, even when applied several times, because it loses a portion of its heat before it can be applied to the parts which it is necessary to burn.

The appearance of a phlegmonous swelling about the surface of the ulcer proclaims the triumph of the actual cautery, and is the forerunner of the suppuration which detaches the cauterized eschar. The parts are to be covered with an emollient poultice until suppuration commences ; a decoction of bark, or bitter plants, is then to be employed.

When the eschars have fallen off, and the bottom of the wound is hard and red, it is to be treated like any other simple sore, and in general heals well, but not so quickly as other ulcers which have not been affected with hospital gangrene ; but when the bottom of the wound, instead of being red and solid, and furnishing laudable pus, is covered with pale bloated granulations, a return of the disease is to be feared. To prevent it, the patient should be purged with a decoction of tamarinds ; we may then return to the use of the super-tartrate of potash, in smaller doses than before, and on the alternate days. This plan is to be continued till a cure is effected, interposing a mild purge every ten or twelve days. But when the disease has returned, without loss of time we must attack it with a red-hot iron, lest the exhaustion of the patient leave him without hope ; for, in such a case, every other remedy will be useless. A relapse seldom occurs ; but in wounds or ulcers of large extent, which require patients to remain a long time at an hospital, it is sometimes mortal, and frequently occasions chronic ulcers, of which the cure is extremely difficult, and impossible.

Although we have hitherto treated of wounds made by cutting instruments only, most of the considerations and precepts to which they have given rise, and especially those which relate to complications, are applicable to wounds in general, and of course to those of which we are now about to speak.

ARTICLE IV.

Of Punctured Wounds.

Pointed instruments, such as a sword, knife, or nail, act in two different ways in producing solution's of continuity : they are either plunged perpendicularly or obliquely into the skin, cellular tissue, muscles, &c. and occasion a simple puncture ; or, having reached a certain depth, they act in a direction different from that in which they were plunged, and then they tear the parts more or less, and occasion a lacerated wound.

Punctured wounds present nearly the same phenomena as those made by cutting instruments : there is always bleeding, to a greater or less degree ; but the pain is much more severe, since the instrument tears the parts.

When these wounds are simple, they heal of themselves, or by the aid merely of some diseuient applications ; but they may be complicated with hemorrhage, inflammatory swelling, or the irritation of foreign bodies.

Hemorrhage takes place when the punctured instrument has met in its course an artery of some size, and punctured or divided it : in either case, blood escapes outwardly, when the wounded artery is superficial, and the wound which has been made is parallel to the skin ; but when the puncturing instrument has passed very obliquely into the part before it has reached the artery, the blood filtrates into the cellular tissue, and produces a false primitive aneurism, unless the escape of blood be quickly prevented, by compressing the vessel at the wound ; or above it, through the soft parts by which it is covered. In the latter case, there is quickly formed, at the mouth of the artery, a clot of blood, which prevents further hemorrhage ; but if the compression be not properly made, if it be not sufficiently strong, or continued long enough to obliterate the vessel, the clot quickly becomes detached, and forms a false consecutive aneurism.

In every case, therefore, where the wounded artery is not situated very superficially, and where it has not a suitable point of support for efficacious compression, whether the blood flow through the external wound, or infiltrate the cellular tissue, we must place no confidence in this remedy ; it procures only a transient relief, and leaves the patient exposed to a false consecutive aneurism. The only part we are to take, is to lay bare the artery, and tie it above and below the part which is wounded.

Inflammation is the most ordinary complication of punctured wounds. It usually depends upon the injury of a greater or less number of nervous filaments, the puncture of which produces acute pain, severe irritation, an inflammatory tension, which is in proportion to the sensibility of the part, the number of nerves it contains, and the density of its tissue: hence it is greatly to be feared in punctures of the fingers. These parts are enveloped by strong aponeuroses, which prevent them from yielding to the inflammatory congestion, which takes place, in such cases, to a great degree, especially if any foreign body have been left in the wound.

We should be careful not to give a favourable prognosis in cases of puncture, even when at first they are not attended with any unfavourable symptoms; for a puncture, simple in appearance, is often followed by high inflammation, deep and extensive abscesses, and even gangrene of a limb.

When a punctured wound is attended with slight inflammation, we should have recourse to the general and local antiphlogistic remedies; and if, notwithstanding these means, the inflammation increase, and threaten gangrene, we should cut the punctured wound, in order to arrest the irritation; or destroy it, by introducing into the wound a troche of minium, or what is better, by the application of caustic potash. The surgeon is to determine which of these methods is preferable, according to the depth of the puncture, or structure of the part.

Foreign bodies are often left in wounds, which have been caused by glass, splinters of wood, &c. Their presence may be ascertained, by examination of the body which has produced the wound, by the pain which the patient experiences, especially in moving the limb; by pressing the part with the fingers, or by introducing a probe.

They should be extracted with a forceps without delay; if it is necessary, the wound is to be enlarged for this purpose. When they cannot be extracted, the pain continues to be very severe, and after a certain time an abscess is formed; by opening which, the foreign body is discharged, or may be easily extracted.

Lacerated wounds are those in which the puncturing instrument, after having passed a certain depth, is forced in another direction, and tears the parts which it first penetrated: these wounds are so irregular, it is not possible to re-unite them; they are to be treated as suppurating wounds, and emollient applications must be immediately made; the swelling is usually confined to the lips of the wound and the

adjacent parts, and quickly yields to relaxing applications; but if it extends far, it must be treated not only by the most powerful antiphlogistic remedies, but also by a suitable enlargement of the wound.

ARTICLE V.

Of Contusion and contused Wounds:

Contused wounds are of two kinds: those which are produced by ordinary weapons, such as a stick or stone; and those produced by a musket or cannon ball. We shall treat of these last particularly, after having spoken of ordinary contused wounds.

SECTION I. *Of Contusion produced by ordinary Violence.*

Contusion produces two kinds of wounds; it may either compress and derange the structure of parts below the skin, without producing any external solution of continuity. This constitutes what is termed a *contusion*; or, if it act with greater violence, the skin is broken, and a *contused wound* is produced. In contusion, the skin being more supple and elastic, the soft parts below it yield and preserve its continuity, while the cellular tissue and small vessels are ruptured. The blood which proceeds from these vessels is filtrated in the cellular tissue, and even into the skin, forming a violet coloured spot, which is called *ecchymosis*.

Ecchymosis is generally proportioned to the violence of the contusion; but it may take place to a very great degree, where the contusion is slight, provided a considerable vein be ruptured: the fine and delicate structure of the skin singularly favours the formation of ecchymosis; there are some persons who cannot be touched without experiencing it. When the contusion is slight, the blood is merely injected into the cellular tissue; but if it be violent, it may collect in a mass, which is sometimes of considerable magnitude.

The effects of contusion are increased by the density of the instrument, and the violence with which it has acted, the laxity and venous vascularity of the bruised parts, and the vicinity of bones. Thus a contusion on the internal surface of the tibia is more severe, and its effects are

more clearly developed, than similar violence to the calf of the leg.

The action of contusing bodies is not confined to the skin, the cellular tissue, and the numerous vessels which meander through them; it extends also to nerves and large arteries, to the muscles, bones, cartilages, and even into internal organs.

The contusion of the small nervous filaments is followed by pain, irritation, and congestion, accompanied with painful tension. When a nerve is moderately bruised, the pain is proportioned to the proximity of a bone in the direction of the violence. We have examples of this, in the cubital nerve, between the internal tuberosity of the humerus and the olecranon, the radial nerve of the middle and external part of the arm, &c. But if contusions of these nerves are great enough to disorganise them, the parts to which they are distributed lose their sensation and motion: palsy of the whole arm may be produced by a severe contusion of the brachial plexus; the extensor muscles of the hand and fingers, by a contusion of the radial nerve; and that of the deltoid muscle, by contusion of the circumflex nerve, as in luxation of the humerus. If contusion destroy entirely the organization of the nerves, the paralysis is irremediable; if otherwise, the parts may regain, after a time, their sensation and motion, as I have frequently witnessed.

The contusion of large arteries is sometimes followed by their rupture and a false primitive aneurism; and if the percussion be not great enough to rupture their coats, it will weaken them to such a degree, that they will afterwards yield to the impulse of the blood, and form a true aneurism. The contusion of muscles renders their contraction painful, difficult, or impossible; that of a bone is sometimes followed by caries, or necrosis: contusion of articular cartilages is sometimes accompanied by inflammation of the joint, suppuration, caries, and consecutive luxation. Lastly, contusion of internal organs may give rise to many very serious symptoms; but as we shall hereafter treat particularly of contusion of the viscera, we shall merely remark at present, that it often proves fatal.

Contusion may terminate differently, according to the degree of violence which has been inflicted.

When the contusion is moderate, and the blood which has escaped from the ruptured vessels is merely infiltrated into the cellular tissue and substance of the skin, it terminates by resolution, the pain and tension quickly cease, and the ecchymosis is gradually dissipated; the part which was

black assumes a reddish-brown colour, which changes to a deep yellow, and that is succeeded by the natural colour of the skin.

While ecchymosis is resolving, it extends in size. This arises from the mixture of serum, furnished by the exhalent vessels, with the infiltrated blood, by which means the latter is rendered more liquid, and passes from cell to cell, to parts more remote from the wound. Thus, after spraining the foot, the ecchymosis continues to extend for several days, until it affects almost the whole leg. The same thing takes place in fractures, and in many other instances.

When the contusion is very severe, and the quantity of extravasated blood very great, and when this fluid collects in a mass in the lacerated cellular tissue, the part is commonly black, which might lead us to fear gangrene; but, if this blackness cease on pressure, if it be soft, and unattended with pain or great swelling, and if the parts affected be still warm, we may conclude that life still exists in them, and that resolution may take place, notwithstanding the collection of blood in the cellular tissue. There are many examples of sanguineous tumours which have terminated by resolution, after a greater or less time; but it sometimes happens that all the effused blood cannot be taken into the circulation, and then we are obliged to discharge it by an opening; but such openings are not to be made until we have waited long enough to know that resolution is impossible.

When contusion is excessive, it may give rise to gangrene, which may be the immediate effect of the disorganization of the parts; or it may succeed to the excessive stupefaction which accompanies the injury. We shall speak of this effect of contusion in treating of gangrene.

The prognosis of contusion depends on the parts affected, and the violence they have suffered. In forming his opinion, the surgeon should consider the nature of the parts affected, their situation, the form of the instrument which caused the injury, the force with which it acted, and the symptoms which the patient has experienced.

In the treatment of contusions, repellents are always to be employed in the first instance; not with a view to prevent the infiltration of blood, which must necessarily follow the rupture of the vessels, nor to promote resolution, by exciting absorption; but merely with a view to oppose the afflux of humours to the part affected, which results from the irritation, the distention, and even rupture of small nervous filaments. In fact, by means of repelling remedies,

such as saturnine lotions, a solution of the muriate of soda in water and vinegar, &c. we excite in the vessels a constriction which opposes the afflux of humours, and prevents, at least in part, the congestion and painful tension which almost always accompany contusion.

When the contusion is moderate, the repellents should be continued until entire resolution of the ecchymosis. Their effect is aided by gentle friction of the part. These frictions attenuate the blood, disperse it in the cells of the cellular tissue, and thus favour its absorption. When the contusion is considerable, in one or two days after the accident, tumefaction and painful tension supervene, which render repelling remedies improper. In these cases, we are to have recourse to emollient and anodyne cataplasms, or fomentations, according to the nature of the parts affected; the patient should also be bled, and subjected to a low diet, according to circumstances, and use a diaphoretic drink. When the tension and pain are dissipated, and inflammation is no longer to be feared, we should abandon the use of emollients and anodynes, and have recourse to the most active resolvents; such as camphorated spirits, a solution of the carbonate of iron in spirits of wine, of muriate of soda, or sal ammoniac in water, to which may be added some brandy. When resolution is taking place, the black and livid colour of the tumour changes successively to a brown, reddish, and yellow, and at length the skin assumes its natural colour. But even this may take place without the parts being entirely cured; for it often remains painful, and more or less incommoded in the performance of its functions, for a great length of time.

When the blood which forms ecchymosis is collected in a mass, resolution takes place very slowly, or not at all; in which last case, we are obliged to open the tumour, and evacuate the blood by a proper opening. But we should not be in a hurry to make such an opening, because the blood thus effused may remain a long time without undergoing any change. Observations prove, that masses of blood, which, from their great size, we should have thought incapable of being absorbed, have, in fact, been taken into the circulation, without any ulceration or opening of the skin. We, therefore, run the risk of subjecting our patient to useless pain, by opening too soon collections of blood arising from contusion; but when the opening is really necessary, we should not hesitate to make it. If the tumour be small, and so hard as to lead us to believe that the blood is coagulated, we should make in its centre an incision large

enough to discharge the blood, and treat it as a simple wound. If the tumour be large and very extensive, soft and fluctuating, which indicates that the blood it contains is liquid, we should make the opening at the most dependent part, large enough to give vent to the blood: we should then endeavour to excite re-union of the sides of the cavity, by a suitable pressure. If one opening be not sufficient, several must be made in those parts which appear best calculated to allow of its escape.

Contused wounds vary according to their extent, direction, and particular figure, and to the circumstances which accompany them. They may be simple or irregular, complicated with hemorrhage, foreign bodies, or inflammation. But whatever be the difference of contused wounds, when they are simple, or even when they are complicated with foreign bodies, which can be extracted, they ought to be immediately re-united; for although their lips are not so regular as those made by incised wounds, and the vascular parts have been more or less injured, experience teaches us, they may be united by the first intention; but, as the contusion is generally greatest at the external part of the wound, there is generally a slight suppuration; nevertheless, at the bottom of the wound, adhesion always takes place.

In uniting the lips of contused wounds, we must not press them against each other, because swelling always comes on, which would render it necessary to remove the dressings. The application of sticking-plasters answers extremely well in these cases, because they yield sufficiently to prevent them from binding the parts too strongly. When the edges of the wound have been approximated, the external part is to be covered with a simple digestive; and if the lips of the wound be greatly swollen, poultices are proper. If adhesion do not take place, and inflammation and suppuration come on, we should proceed as in other suppurating wounds.

Contused wounds, with an angle, ought to be re-united, even though the pointed lip be apparently disorganized. If it be really so, it will undoubtedly slough off; but as its base is always less bruised than its apex, it will immediately re-unite, and suppuration will take place in that part of the wound only which is diorganized.

When the lips of a wound are so bruised that they cannot unite without suppuration, we ought gently to fill it with lint, and apply over this a compress wet with an astringent decoction, in order to moderate the inflammatory congestion which results. When the congestion is come on, we should apply emollient and relaxing remedies; and when suppura-

tion is established, the wound well drained, and its sides covered with granulations, they are to be approximated with sticking-plaster.

Contused wounds may be complicated with hemorrhage, foreign bodies, and inflammation. If a considerable artery be opened, it must be tied; compression would only increase the irritation already existing, and produce excessive inflammation. If the inflammation be severe, it must be treated by bleeding, low diet, cooling drinks, and by emollient and anodyne applications. Wounds made by brittle bodies, such as glass, porcelain, &c. require particular attention, in order to extract the foreign bodies. If we do not succeed in this, and irritation be kept up for a long time, which prevents a cure, an abscess is sometimes the consequence: and, at other times, the foreign body, after a great length of time, appears under the skin, whence it must be extracted.

SECTION II. *Of Gun-shot Wounds.*

Bodies projected by the force of powder may produce a contusion, without breaking the integuments. We shall speak of the first of these effects after having treated of the second.

Gun-shot wounds differ from other solutions of continuity from external violence, by the severe contusion of the lips of the wound, which extends, to a greater or less degree, to the surrounding parts. This explains the peculiar symptoms which attend them. Gun-shot wounds differ so much from one another, that one might almost say that no two had ever been alike. Notwithstanding this variety, they have so great an analogy to each other, that we may give general rules for their treatment, which are applicable to every case that can be met with. The varieties of these wounds arise particularly from the body which causes them, the course it takes, the nature of the parts which it affects, and the particular circumstances which accompany them.

The substances which generally produce gun-shot wounds, are musket or cannon balls, pieces of shells, hand-grenades, or slugs of brass or lead. These substances destroy the structure of our bodies, by the bruising and excessive contusion which they produce; an influx of blood into the small vessels of the neighbouring parts takes place, and their rupture gives rise to ecchymosis.

Balls are generally smooth; but sometimes they are rough and unequal, as when they have been pounded, or cut, or have been impinged against any other body, before

they caused the wound. Sometimes there is only one ball in a weapon, sometimes there are several; in which case they may be separate, or connected by a chain. A wound made by a regular ball, which enters the body perpendicularly, is round; but when the ball has changed its form, or has entered the part obliquely, the wound is more irregular.

When a ball encounters a bone, if it retain sufficient force, the bone is broken; otherwise the ball becomes flattened, and stopped, or perhaps is thrown in another direction; it then slides along the interstices of the muscles, or stops in them: even cartilages, tendons, and aponeurosis, may change the course of balls, when they strike them very obliquely. The courses which balls take, in some of these instances, are very remarkable. Sometimes, after turning round a cylindrical bone, they have been known to resume their former direction, and pass out opposite to the place where they entered. This deviation of balls has nothing uncommon with their subsequent displacement, which is produced by the action of living parts, or by their own weight.

If a ball, moving with great velocity, strike perpendicularly a cylindrical bone, it breaks it in pieces, and often the ends of the bone are split to a considerable distance. A ball seldom fractures a long bone, either obliquely or transversely, without detaching several splinters. I have, however, seen one example of this kind, in an officer of distinguished bravery. In the glorious campaign in Poland, General Rapp, aid-de-camp to his Majesty the Emperor, received a musket-shot in the left arm; the humerus was fractured at its lower part, without a single scale or splinter; the wound was at the external and posterior part of the arm, and had but one opening; the ball lost itself in the flesh, and all endeavours to find it were fruitless; the ends of the bone did not become displaced, and the wound healed almost as soon as any other fracture. The ball remained eleven months in the arm, without producing any remarkable inconvenience. At the end of this time it was extracted through an opening into an abscess which it had caused near the elbow. It was half a musket-ball, which was flattened in that part of its circumference which had struck the humerus.

When a ball strikes a prismatic bone upon one of its edges, it sometimes removes a portion, without fracturing the bone. At the commencement of the Revolution, I saw a watch-maker, the anterior part of whose tibia was broken off in this way by a ball, which passed toward the opposite leg, and tore the teguments and part of the adjacent muscle.

The wound swelled prodigiously, suppuration became very copious, the bone was covered with granulations, and, after a very long time, the patient was cured.

A ball may remain buried, more or less deeply, in the substance of a long bone, or between two bones, as those of the fore-arm or leg. A ball which strikes against a flat bone, unless its direction be very oblique, generally enters and remains fixed, or passes beyond it, according to its velocity. In this last case, the opening in the bone is of the same size and shape as the ball, and sometimes very regular, without any splinter or projection.

When a cannon-ball strikes very obliquely any fleshy part, as the calf of the leg, it may remove a large portion of its substance, and make an enormous wound, without producing death; it may also, if it strike very obliquely, produce a severe contusion, with crushing of the flesh, considerable collection of blood, and even fracture of bones, without division of the skin. When a cannon-ball strikes a limb perpendicularly, it generally takes it off entirely, or produces such an extent of injury that amputation becomes necessary. Balls do not always confine their action to the parts which they strike, and those which are near them; they often cause a commotion, a violent internal shock, which extends along the nerves to a great distance, deranges their interior structure, and affects greatly their functions. It is difficult to determine the degree and extent of this shock; they depend upon the violence of the blow. It is often communicated, through the nervous system, to the brain, and there causes derangements, of which we shall speak hereafter.

Commotion is always accompanied by stupefaction, which weakens the action of the soft parts, and predisposes them to inflammatory congestion, and gangrene. Sometimes the stupor is so great, that the part remains as if dead for several days. This state is often terminated by gangrene, and sometimes by death.

The opening through which a ball passes out, is larger than that by which it enters. The skin and the flesh are pressed down where the ball enters, and project out where it makes its exit. This difference is produced by the mechanism of the parts, and the attrition from the action of the wounding body. In fact, a ball, when it first enters a part, moves more quickly than when it has nearly passed through it; consequently all the effects of attrition, as extravasation, congestion, and swelling, must be greater at the place of its entrance than at its exit. On the other hand, the contusion being always in proportion to the re-

sistance of the parts which are struck, those which the ball first encounters must experience a greater degree of it, since they offer a greater resistance, on account of the support they receive from the whole thickness of the limb; of course, the contusion bears a proportion to the size of the member: hence it is that this side of the wound is most swollen, and the entrance of the ball is necessarily contracted by the swelling.

In general, gun-shot wounds do not bleed, because the attrition of the wounded parts is so great, that the vessels which have been torn by the instrument are contused to such a degree, that the blood which circulates in them cannot escape. Nevertheless, it often happens that hemorrhage does take place, especially if a large vessel have been opened, or severely bruised. In the former case, hemorrhage takes place immediately; in the latter, after the expiration of ten or twelve days, that is to say, when the eschar is separated.

The lips of a gun-shot wound are black and livid. The ancients attributed this to the combustion of the flesh by the ball; but it is really produced by the attrition and disorganization of the parts. The bruised and disorganized parts form eschars; the parts about the wound are yellowish, brown, violet, or black, according to the quantity of blood extravasated into the cellular tissue, and the time that has elapsed since the wound.

Gun-shot wounds often contain balls, wadding, pieces of cloth, money, &c. and parts which have been separated from their connections by the wounding body, such as scales of bone.

When the wound has but one opening, there is reason to believe that the body which produced it remains in the part; unless the wound be extremely superficial, so that it may have come out at the part at which it entered. This may happen when a ball presses before it a person's shirt, and buries itself in the wound without tearing it, as has often happened. In drawing out the shirt, the ball is extracted. Two wounds in the same part, opposite each other, commonly denote that the ball has passed through; however, it may happen that more than one ball has entered, and one alone has been discharged; or that a single ball has split in two pieces against a bone, and that one half of it remains in the wound. If a musket contain several balls, they may come out at different parts, so as to make two or three wounds, to all of which the observations we have made will equally apply. A ball may carry before it into

the wound, the wadding, a portion of cloth, a piece of a key, or button, and, in general, whatever is before it. These foreign bodies may pass out with the ball, or they may be left in the wound. Sometimes the changes and direction of a ball, its weight, muscular action, &c. remove it far from the apparent direction of the wound, and render it difficult or impossible to find it.

The symptoms of gun-shot wounds, like those of other diseases, are distinguished into general and local. Of these symptoms, some appear at the moment of the wound, some a few days afterwards, and others not till after a great length of time.

Gun-shot wounds, like all other injuries, are attended with pain; but the pain is not acute; the patient experiences, at the moment of the wound, only a sense of weight throughout the limb, as if some heavy body had fallen upon it; but, after a time, the pain becomes acute. Primary hemorrhage, numbness, and local stupor, are also among the symptoms which appear on the first occurrence of gun-shot wounds.

The general primary symptoms of these wounds are, a numbness, with a sense of weight, throughout the whole body; universal coldness, even in summer; paleness of the face; a yellow or lead colour, which it often assumes, and which extends over the whole body; smallness of the pulse, syncope, trembling, general horripilation, convulsive motions, vomiting, and hiccup. The older surgeons attributed these phenomena to the fancied malignity of gun-shot wounds; but it is evident that they depend upon the general commotion and shock which is communicated to the nervous system. These symptoms are generally momentary; but they may be increased by fear, and give rise to others more or less serious, according to the nature of the part which is wounded, and the state of the animal economy at the moment of the wound.

Soon after a gun-shot wound tumefaction appears, which is proportioned to its extent, the degree of attrition, and the nature of the parts affected.

When the wound is small, and interests only the fleshy part, the tumefaction is inconsiderable, and is confined to the course of the ball and the neighbouring parts: it terminates by a copious suppuration, which gradually detaches the cellular tissue, and other disorganized parts, and the wound quickly becomes simple, and begins to heal.

But when the wound is very large, and affects nervous and ligamentous parts, and a bone is broken, the congestion af-

fects the whole limb, and sometimes even extends to the trunk with astonishing rapidity. This congestion may arise from two different causes, which it is important to distinguish in practice. First, The stupor which weakens the part and vessels to such a degree, that they cannot resist the afflux of the fluids, which the circulation carries there, so that the part tumefies and swells very much by the infiltration and effusion of the fluids into the cellular tissue. Secondly. The irritation of nervous parts, which are contused, torn, and often wounded by the pressure of foreign bodies, or by pieces of bone fractured by the ball. This irritation attracts the humours towards the wounded part, and if it be surrounded by a strong aponeurosis, which yields with difficulty to the muscles and cellular tissue, a considerable strangulation occurs, which may produce gangrene. We shall not confound the causes of congestion, if we examine the part with attention; for in the first case it is soft, pale, doughy, and indolent; and, in the second, it is red, tense, hot, and painful.

The congestion which depends upon stupor alone, almost always terminates in gangrene; while that which is produced by irritation may terminate in different ways; sometimes it produces gangrene, sometimes the erythema and irritation continue in spite of the assistance of art, the wound remains perfectly dry, and the patient dies before we can produce a calm, and bring about suppuration; but most commonly the inflammation terminates by a copious suppuration, which often entirely exhausts the strength of the patient. When suppuration begins to take place, and the lips of the wound to sink, hemorrhage sometimes comes on, which is the more serious, as it is often difficult to discover the vessel from which it proceeds; it commonly occurs from the eighth to the twelfth day of the wound, and proceeds from an artery which has been so bruised, that a portion of its coat has been comprised in the common eschar.

The general symptoms, which depend upon the irritation communicated from the injured parts to the whole nervous system, are fever, burning heat of the whole body, with dryness of the skin, great thirst, obstinate constipation, agitation, general or partial convulsions, tetanus, delirium, stupor, &c. When the tumefaction of the wounded part is very great, it is pale and dry; sometimes also there is suppression of suppuration, and internal abscesses: these symptoms are most violent when any viscous, considerable nerve, or large articulation has been wounded.

The secondary consequences of gun-shot wounds, are

suppression of suppuration, secondary abscesses in the affected part, or even in internal parts, the unhealthy state of the granulations, the retarding of the cure by any internal virus, as the serofulous or venereal, hospital gangrene, of which we have already spoken, marasmus, into which the patient falls after long-continued and copious suppuration, and colliquative diarrhœa, which is almost always fatal. If the patient survive all these symptoms, the limb frequently remains in a state of atrophy, and the joints lose their motion, the wound often remains fistulous, either because a portion of dead bone remains at the bottom, and the exfoliation is not completed, or because some foreign body remains in the wound; if the wound heals notwithstanding the presence of foreign bodies, it frequently opens after a length of time, to discharge them; it also sometimes happens that a foreign body or splinter of bone causes an abscess, which we must open, not only to discharge the pus, but also the exfoliated bone. These collections of matter occasionally are not formed until after the expiration of several months, and even a year; sometimes they are not formed at all, and patients frequently carry a ball either in the soft parts, or in a bone, throughout life.

The prognosis of gun-shot wounds cannot be laid down in a general manner; it varies according to the extent of the injury, to the nature of the wounded parts, the health of the patient, &c. Gun-shot wounds, with comminutive fracture of a bone, and considerable destruction of soft parts, are very serious accidents; they frequently render amputation necessary, and are often fatal.

In a general point of view, the indications are, 1st. To change, as much as possible, the nature of these injuries, by proper incisions. 2d. To arrest hemorrhage when it takes place. 3d. To extract foreign bodies if there be any. 4th. To prevent the symptoms which may arise, and to remedy those which have already come on. 5th. To promote suppuration, which separates the dead from the living parts, drains the wound, and effects its cure.

The first indication to fulfil, is to make, after the first dressing, the necessary incisions, in order to convert the injury into an incised wound. These incisions, if properly made, present advantages attainable by no other means; they promote the discharge of the fluids, which the bruised ends of the vessels retain; they prevent excessive inflammation, and its consequences, and obviate the necessity of future counter-openings; they also prevent the strangulation which would result from the re-action of the aponeurosis upon the

tumefied muscles; they facilitate the extraction of foreign bodies; give issue to the fluids arrested in the course of the wound; facilitate the discharge of the bruised and disorganized parts, which suppuration detaches; and, finally, they allow the pus to escape.

But these incisions are not equally necessary in all gun-shot wounds; they are indispensable in those of the large limbs surrounded by a strong aponeurosis, especially when the bones are fractured and the wound contains foreign bodies. They are less necessary in wounds of parts that are not fleshy; such as the head, hands, feet, chest, ginglymoid joints, &c. There are indeed many cases where such incisions are useless and injurious. Surgeons who do not follow a blind routine, never make incisions in these latter cases, unless it be for the purpose of extracting splinters or other foreign bodies, the presence of which would give rise to serious accidents. The dilating of gun-shot wounds should be performed with discernment; experience has shown that large and precipitate dilatations are not suited to wounds that are attended with great commotion of the part, and a tendency to asphyxia. In these cases the organic action of the vessels is so much weakened, that large incisions bring on mortification.

Gun-shot wounds of articulations demand particular attention, on account of the little success with which large incisions have been attended in the treatment of them. Enlightened physicians dilate such wounds only so far as is necessary to extract foreign bodies, and to discharge blood effused in the joint, avoiding as much as possible the ligaments and capsules, so as not to expose the articular surface to the impression of air.

To unbridle a gun-shot wound, the surgeon should introduce into it his index finger, or if that cannot be done, a grooved director. This enables him to conduct the bistouri so as to enlarge the wound sufficiently to admit the whole finger; by the side of which, a very narrow blunt bistouri is to be pressed quite to its extremity; the cutting edge is then to be directed toward the upper part of the wound: now, withdrawing the instrument, and pressing the finger at the same time against its back, we are to cut from within outwards, prolonging the incision as far as we may judge necessary. In the same manner we are to proceed in regard to the inferior part of the wound; beside these two incisions, which give the wound a longitudinal form, it is proper to scarify the parts along the course of the ball. This occasions a discharge of blood, and a draining of the fluids,

If there be bands along the course of the ball, the finger will discover them, and enable us to cut them with the bistouri. When the muscles are covered with aponeuroses, we should always cross them by incisions in different directions, so as to prevent the strangulation of the subjacent parts, when the limb becomes swollen and enlarged. If necessary, we may cut the bodies of muscles; but we should avoid large vessels and nerves, lest we deprive of their nourishment the parts below the incision. Smaller vessels and nerves may be divided if necessary. In every case, the incision should be of equal length within and without, lest the muscles, by swelling, press out the integuments, and form a kind of hernia, which may become very troublesome. If a ball pass through a limb, the wound must be unbridled on both sides, so that the finger may be freely introduced at each orifice. When the apertures are very near each other, we may cut both sides at once, if the structure of the part will admit of it.

It is hardly possible to determine the proper extent of the incisions since it varies according to the size of the wound, the parts which it affects, and other circumstances: much must be left to the judgment of the surgeon. In general the largest incisions are required for the most fleshy parts, and those which are covered by strong aponeuroses, and especially those which are attended with fracture of a bone, or which contain foreign bodies. In this last case, the more deeply the foreign bodies are situated, the greater must be the extent of our incisions, unless the particular structure of the part forbid. If the wound be straight, the incisions must extend equally on each side, but if it be oblique, that incision must be the longest which most nearly coincides with the course of the ball.

Hæmorrhage, which sometimes takes place at the moment of a gun-shot wound, is useful, if it be moderate; but if it be great, it may kill the patient, or exhaust him to such a degree as to render his cure impossible. The first object, therefore, is to make ourselves master of the blood, by placing a tourniquet on its principal artery, or by compressing it by means of an assistant. Afterwards, if the artery be deeply seated in the parts, it must be laid bare, and tied. This compresses the artery alone, and is preferable to every other means, and especially to cramming the wound with lint, which would occasion an excessive and dangerous degree of inflammation. Nevertheless, when the ligature is impossible, we are obliged to have recourse to compression. We must then ascertain exactly the situation

of the orifice of the vessel, and place a piece of agaric upon it—cover this with another, and retain them by graduated compresses, so that the rest of the wound may not be pressed upon. In applying this apparatus, we must take the precautions necessary to prevent it from being displaced, if the patient is to be transported.

When the wound is *unbridled*, we must ascertain, if possible, whether the ball, or any foreign substance, remain in it afterwards. It too often happens, that, despising this precept, the surgeon makes useless and painful searches, when it would have been easy, with a little care and precaution, to have known with certainty that no extraneous body remained.

From what has been said, it is easy to conceive that it is important to attend strictly to the circumstances and the actual state of the wound, in order to throw all possible light on the case. We should, therefore, consider if the ball have not escaped from the wound after having struck against a bone, or by its own weight, when it has not had force enough to penetrate to a certain depth. We have seen an instance of this kind in a small girl, who received a pistol-ball at the anterior part of the thigh. We could not find the ball; notwithstanding this, the wound was not deep, and it soon healed. No one knew what became of the ball, till it was found in sweeping the room where the accident happened. It had escaped from the wound, as the child was crawling across the room to find assistance.

We should examine with care the garments of the patient, as well to know what substances the ball may have carried before it into the wound, as to see if the ball itself be not among the clothes. It often happens that the clothes are carried, before the ball, a considerable way into the body without being broken, and on drawing them out of the wound the ball is extracted. Paré drew out a ball, which had penetrated the thigh of a soldier very deeply, carrying before it a part of a pair of silk breeches, without tearing them. Bordenave saw the same thing in a gun-shot wound of the lumbar regions, with fracture of two of the transverse processes of the vertebræ. He searched for the ball a long time in vain; at length he found it adhering to the shirt the patient had just pulled off. After penetrating the coat and waistcoat, it had carried part of the shirt into the wound, without going through it.

When all the circumstances of a wound lead to the belief that the ball, or some other foreign substance, is lodged in it, we should, in the first place, assure ourselves of the pre-

sence of this body, and of the place it occupies. With this view, the part should be placed, as nearly as possible, in the same situation in which it was at the time of receiving the injury. By this means, when the wounding body has followed its primitive direction, we greatly facilitate its extraction.

To discover a ball, we must not, however, examine the part in one situation only; for it is impossible to calculate on the deviations which may have been given to it, by a bone, a tendon, or even a muscle strongly contracted. On the contrary, we should vary the position of the part, taking into view its structure and motions.

We should also carefully explore the parts adjacent to the wound, and opposite to it, for the ball sometimes is found directly below the skin; nor should we neglect to feel, with great care, every part of the wound, and to compress it in every direction, and especially in that in which it appears most probable the ball is lodged. This is the best that we can do, since it is impossible to know what course the ball may have taken.

When these endeavours do not discover the foreign body, we must feel for it, by passing the finger into the wound. This is the best sound we can use; we ought, indeed, to use no other, except when the wound is too deep for it to touch the bottom, and when the hand, strongly pressed against the opposite side, cannot shorten the wound enough for this purpose. It is right to move the finger about in the wound, as the ball is sometimes discovered in this way. The sound which should be used when the finger does not answer, ought to be of some size, lest it make a false route; and flexible, that it may easily take the course of the wound, should it be tortuous.

But in every case when the foreign body has been laid bare, before we proceed to extract it, we should ascertain precisely its situation, nature, form, and the size of the opening which it will be proper to make for its discharge; what are the obstacles which oppose its extraction; and what parts must be spared, and what must be sacrificed. Thus we shall form a sound judgment of the possibility and the necessity of the extraction which is to be performed whenever the presence of the foreign body will occasion more injury than its removal. These circumstances often impose upon us the necessity of leaving balls in wounds, and sometimes oblige us to take them away at any rate, even at the risk of the loss of the part, or what

is more, the life of the patient, when its remaining in the wound would inevitably prove fatal.

When the extraction of a ball is deemed necessary and proper, it should be done as soon as possible after the wound. If we defer it, tumefaction and inflammation come on, and the extraction cannot then be attempted without the utmost danger. When, therefore, the ball has not been extracted immediately, and inflammation has already supervened, we must wait until suppuration be well established. Sometimes nature alone casts off the offending bodies, whose extraction has been neglected, or tried without success; but there is great danger in trusting to this, for the foreign body is apt to create alarming symptoms, which are quelled only by its extraction. In this case, we should try every resource to get rid of it—make new incisions, if the former have been insufficient, and obtain a passage to the offending substance, if it be possible.

The extraction of a ball, or any other foreign body, may be made through the place of its entrance, or by a counter-opening. In general, we should take the shortest course, unless the structure of the part present obstacles. In this case, we must take not the shortest, but the safest route.

A counter-opening is necessary, 1st. When the foreign body has passed the centre of a limb, and approached the opposite side. 2d. When the wound is so deep that it is impossible to carry the dilatation down to the foreign body; or, if superficial, when the necessary incisions would intersect important parts, and especially blood-vessels. 3d. When the tortuous course of the wound, the change in the position of the vessels, or the swelling prevents us from finding the course of the ball, or distinguishing it through the skin and flesh. In all these cases, we must cut down upon the foreign body, and give two openings to the wound, the communication between which affords a ready discharge to the eschars and pus. But, before making the counter-opening, it is necessary to ascertain, as exactly as possible, the situation of the ball; or, at any rate, to be able to cut down to some part of its course.

The mode of making a counter-opening varies, according as the ball is immediately under the skin, or situated so deeply that it cannot be felt. In the first case, in place of cutting on the ball, which cannot be done without pushing it further down, and without the bistouri's being liable to slip, and causing a broken and incomplete wound, we should draw up the integuments, so as to make the incision at a single

stroke. In the second case, the integuments are to be stretched between the thumb and finger, in a direction perpendicular to that in which the incisions are to be made; we are then to cut, to a convenient extent, through the skin and other soft parts which cover the ball.

We should seldom succeed in extracting balls and other foreign bodies, if we did not previously enlarge the opening of the wounds, by incisions made in the manner we have described.

When the incisions are completed, the first attention which is necessary before we proceed to extract the ball, is to recollect the disposition and structure of the parts concerned. We should place the part in a position similar to that in which the wound took place. This rule is of great importance, and experience has often proved its utility; it is, however, subject to some modifications. Thus we should sometimes relax the muscles, to prevent them from binding the ball, either by pressing it against a bone, or between the muscles themselves; sometimes we should make them contract, so as to dislodge the ball, and to offer such resistance as to prevent its being pushed before the forceps.

When the part is conveniently placed, we are to proceed to extraction. If the ball be not deep, it may be removed by a finger, together with any piece of cloth or wadding which it has carried before it; but we can seldom succeed with the fingers alone; we are obliged to have recourse to instruments, which should vary according to the structure of the parts in which the ball is lodged, the part it occupies, and the manner in which it is fixed.

When it is too deep to be seized with the fingers, and is, at the same time, free and moveable in the soft parts which enclose it, we may employ a scoop, which is terminated by a button; such as is used, in the operation of lithotomy, to scoop up the fragments of a stone. This answers the purpose perfectly well: the ball is brought out, by pushing it against one side of the wound; and we seldom fail to succeed in this way, especially if the finger can be carried into the wound, so as to place the ball in the hollow of the instrument. But this instrument cannot answer, if the ball be much flattened, very large, or near a cavity into which it is liable to fall.

The scoop is to be held like a writing-pen, and to be passed gently into the wound until it reach the ball; it is then to be pressed along one of its sides, and withdrawn.

M. Thomassin has constructed a scoop, which is more easy of application, and more effectual than the ordinary

instrument. It is one of the best instruments which could be devised for the extraction of balls. It is formed of two branches, which slide upon each other by means of a groove. That which, properly speaking, is the body of the instrument, is eight inches long; at one of its ends is a kind of spoon, which is deep enough, and sufficiently curved to contain and hold the ball: the other end has two rings, one on each side, to receive the fingers; it is hollowed at its anterior and concave part, the other branch is exactly of the same length of the first, with the exception of the ring at its extremity; it is fitted to the groove of the other: its point is cut into an edge, so as to correspond to the edge of the spoon, which is received into a groove near its edge. This groove prevents the branch from going farther from the spoon. The *biseau* is intended to enter into a ball, so as to retain it in a spoon. A screw passes through this branch, a little below the rings, the ends of which pressing against the branch of the *biseau*, serve to fix it when necessary. This branch is graduated on the convex part of the other ring, so that the operator is able to judge of the size of the ball when it is in the spoon of the instrument. The two branches being united, are introduced to the bottom of the wound, and held like a pen. When the ball is touched by the end of the spoon, it is clenched, and the *biseau* is raised about an inch. The *biseau* is fixed at this height by half a turn of the screw. The spoon is then opened to receive the ball, and is easily passed along its side. When the ball is felt in the spoon, the instrument is to be used so as to dislodge the ball from the parts around it; half a turn of the screw then sets the *biseau* at liberty, and it is to be pushed upon the ball, by placing the thumb of the left hand in the ring, while the middle and index finger act upon the spoon. We may pass its point into the ball, by strong pressure, or a turn of the screw. We are now sure of our object; however, we must not draw out the ball with violence, but, on the contrary, extract it very carefully. We consider this the best instrument which has been devised for the extraction of balls.

When we think it will not answer, we may employ the forceps. That of Percy is the best. The whole length of the instrument is thirteen inches; that of the branches, six inches. Each is terminated by a kind of claw, the edges of which are thin, united within, and moderately hollow. They are joined by two plain surfaces, which do not increase the size of the instrument; so that we may pass in the instrument as far as we please. They are kept together

by a kind of turning-hinge, which enables us to separate them, or to introduce them successively. Mr. Perey has contrived this instrument, so as to make it answer the purpose of a scoop. An engraving of it may be seen in a work of this celebrated surgeon, called, "*The Army Surgeon's Manual*," which we cannot too strongly recommend to our readers.

The forceps is to be used in this manner: The finger being introduced into the wound, and the forceps closed, they are to be slipped along it down to the ball, which is to be seized, while, at the same time, we avoid comprehending any membrane, nerve, or blood-vessel; and the instrument is to be withdrawn with a slight lateral motion. But if the ball cannot be reached with the finger, it must be pressed to the opposite side by an assistant. This pressure not only brings it nearer, but renders it immoveable. Though we be able to feel it only with the forceps, we may, nevertheless, take hold of it with caution. When it is engaged in the forceps, we must study its position, and withdraw it with as little force as possible.

When the wound is very deep, and incisions cannot be carried quite to the bottom,—when the ball is near a cavity or articulation, into which the slightest force may throw it, the branches of the forceps must be introduced separately. We begin by placing one of the branches by the side of the ball, and hold it there until the other branch is introduced, when it is to be extracted as before. When the ball is covered with cellular tissue, it may be forced by the nail at the end of the forceps.

If the ball have carried before it pieces of garments, money, part of a watch, or button, they are to be extracted in the same way as balls, either with a finger, a scoop, or forceps, according to their form, their size, and their situation: sometimes they are nearer the orifice of the wound, and sometimes lower down. If the bone be fractured, its splinters are pushed before the ball. They require to be extracted. Sometimes pieces of linen, cloth, or paper, adhere to the sides of the wound, and elude the strictest examination.

When a ball is wedged in the substance of a bone, its extraction requires a process very different from that we have detailed. When it is not buried in the bone, and the edges of the opening it has made are broken, it is easy to move it with an elevator, and take it out; but, in other cases, there would be danger of pressing the elevator into the medullary canal of a long bone, or into the cavity of a flat bone. In this

case, we must have recourse to a *ball-extractor*. This instrument, which was formerly so much employed, is now limited in its use to the case of which we are speaking. Mr. Percy's ball-extractor, which is best, is six or seven inches long.

The ball-extractor is of no utility where iron, copper, glass, stone, or flattened balls of lead, are strongly wedged in the bone. In such cases, we must have recourse to the trepan. When we trepan a bone, in order to extract a ball, we sometimes cut around it with a large trepan; and when we have penetrated to a sufficient depth, we endeavour to remove the part with the ball enclosed in it. Sometimes we make, at the side of the ball, with the perforator, a hole large enough to admit the end of an elevator, so as to force it out. Each of these methods has its advocates, each may be successful in skilful hands; but the last alone is applicable where the ball is very large.

It may happen that the ball, not having passed through the whole thickness of the bone, forms a tumour on the opposite side: we should then make a counter-opening for the trepan. For this purpose, it is necessary to cut through the soft parts down to the tumour; and if the bone which contains the ball cannot be taken out with a strong forceps, or a cock's-comb saw, we must use the trepan, and push the ball through the opposite side.

Splinters of bone may be extracted with the forceps or fingers; but they should not be removed, unless they be entirely detached, or so much so, that they cannot re-unite to the adjacent parts. In this last case, we should carefully cut the bands by which they adhere. The splinters which we do not remove, should be carefully put in their places, so that they shall not prick tender or nervous parts. Sometimes these splinters re-unite to the bone from which they have been separated; at other times they are detached by suppuration, and are easily removed.

Foreign bodies are sometimes so concealed in wounds that they cannot be discovered. We should then wait until some circumstances make known the places of their situation. When their presence is ascertained, it is sometimes more difficult and dangerous to extract them, than to let them remain. In every case, we should defer their extraction until suppuration renders them moveable, and places them in a more favourable position; or else let them alone altogether, without disquieting ourselves, as daily experience proves, that it is far better to leave a ball at the bottom of a wound, than to extract it with violence. It has

been thought that balls, wedged in a bone, formed an exception to this rule ; but balls have been known to remain in bones without the least inconvenience. It must be confessed, however, that these are rare cases.

Having unbridled the wound, arrested the hemorrhage, and extracted foreign bodies, we should apply a suitable dressing, and combat the circumstances as they rise.

In the first place, the wound is to be filled with soft lint, to be wet with a solution of the muriate of soda, or the acetite of lead, and compressed by a loose bandage. Spirituous applications, formerly so much used, are injurious, by the contraction and irritation they occasion, which delay the process of suppuration.

When the swelling is moderate, it terminates in suppuration ; when very severe, it causes gangrene, or extensive abscesses, which may prove fatal. The first object, then, of a surgeon should be, to prevent too great inflammation, and to diminish it when it comes on. For this purpose, low diet, bleeding, and cooling drinks, are to be used according to circumstances.

The diet should be diluting and cooling : solid food and wine must be prohibited, unless the patient be very delicate, or worn down by fatigue, as is frequently the case with wounded soldiers.

The bleeding must be repeated, according to the extent of the wound, the age of the patient, his strength, and the severity of the symptoms. We must abstain from it entirely, if the patient have lost much blood, or if he be exhausted by any other cause, or if there be general commotion and stupor. In these two cases, far from diminishing the strength of the patient by bleeding, we should endeavour to repair it by broths ; and, in the third, we should endeavour to rouse the vital principle, by cordials and volatile spirits.

In all cases of gun-shot wounds, the state of the first passages demands particular attention ; and when the stomach is full of food at the moment of the wound, or there are indications of saburra, we should administer an emetic of the tartrate of antimony. If we fear that the shock of the vomit would be injurious, as in comminutive fractures, large wounds in the head, &c. we should endeavour to supply the place of an emetic by injections and diluents. If the stomach and intestines be surcharged with alimentary matters, the fever will be protracted, and may even change to a bilious or putrid fever. Soldiers especially require to be evacuated soon after they are wounded. Most soldiers, in consequence of the fatigue they undergo, are

disposed to diseases ; often, at the moment they are wounded, their stomachs are full of unwholesome food, which frequently give rise to bilious fevers. This may be prevented by the timely administration of an emetic.

These means do not always prevent an attack of fever, but they frequently do. In those cases it is proper to conjoin with antimonial drinks, blisters, vinous lemonade, or even pure claret ; and bark, when the prostration of strength is excessive. This last remedy possesses, in a very high degree, the power of giving tone to the solids, of strengthening the stomach, of preventing fever, and bringing on healthy suppuration. It seldom disappoints the practitioner, who precedes the use of it by the administration of an emetic.

In cases of simple gun-shot wounds, which affect only the soft parts, the tumefaction is generally moderate ; and when the eschars are detached, the patient may take a little solid food ; the quantity of which is to be gradually augmented, while the strength of the patient is supported by bitters and wine.

When the bones are fractured, we may expect a copious suppuration. We should, therefore, endeavour to moderate it, by the use of low diet, cooling drinks, and copious bleeding. If the nervous system be irritated, we may administer Hoffman's drops, syrup of poppies, or tincture of opium, or other sedatives ; but when the inflammation has subsided, and suppuration is well established, we should support the strength of the patient by a mild and nourishing diet, by a little wine, and, above all, Peruvian bark, the effects of which are excellent when patients are exhausted by long-continued suppuration. It should be given in very large doses.

As to topical applications, nothing answers better, during the first days of the accident, than a solution of salt in water. This is a powerful resolvent ; it dissipates the ecchymosis, and frequently prevents the appearance of gangrene. Afterwards, the choice of topical remedies must be regulated by the nature of the congestion. If it be owing to stupor of the part, it is soft, flaccid, and doughy, and often terminates in gangrene. In such case we should endeavour to rouse the vital principle by spirituous and tonic applications ; such as a strong decoction of bark, or ammonia, cataplasms of the four discutient powders, powders of aromatic plants boiled in red wine, with one third brandy, &c. But if the tumefaction depend upon the irritation of the nervous parts ; if there be tension, heat, and pain, we

should have recourse to emollient and anodyne applications; the wound should be dressed with simple ointment, and covered with compresses wet with an emollient decoction, or with a poultice.

These applications, especially the poultices, diminish the pain, irritation, and tension, and favour the establishment of healthy suppuration; but they are not proper after this effect is produced, for they would relax the granulations, render them soft and spongy, and retard the cure of the wound. If this state of the parts do occur, we must have recourse to stimulating and tonic applications; and if these do not succeed, to moderate pressure, provided it be practicable.

Hemorrhage which arises from the separation of the eschars, requires great penetration, vigilance, and anatomical knowledge on the part of the surgeon. If there be large vessels near the wound, he ought to watch the patient from the ninth to the twelfth day, and be particularly on his guard at that period; a tourniquet, if possible, should be placed on the limb, and some intelligent person should be constantly at the patient's side, to tighten it, until the arrival of the surgeon. Secondary hemorrhage is very serious, because the swelling of the part renders it very difficult to apply either compression or a ligature. The last of these means is altogether preferable, and should be applied at any rate, when the blood proceeds from a large artery. When it is impracticable, and the artery is of moderate size, we are obliged to use compression. This is best done by pressing, with the finger of an assistant, agaric against the bleeding vessel, until the hemorrhage be effectually arrested.

Gun-shot wounds are particularly liable to the complications of wounds, of which we have already spoken.

When the eschars are separated, and healthy suppuration is established, the wound becomes a simple one, and must be treated as such.

Gun-shot wounds may be divided into two classes: those which affect the soft parts alone, and those in which a bone is injured.

In the former case, there is sometimes only one opening, sometimes there are two. In the first case, it is presumable that the ball remains in the wound; however, before we proceed to search for it, we should examine carefully the garments of the patient, in which it is sometimes found. The unbridling of the wound facilitates the extraction of foreign bodies. When this is effected, the wound is to be

gently filled with lint, and the limb enveloped in compresses wet with a solution of salt and water. In two or three days, poultices are proper.

When there are two openings, it is probable that no foreign body is lodged in the wound; however, this is not a certain conclusion, since the musket may have contained several balls, and may, moreover, carry in pieces of the clothes, &c. which do not pass out with the ball: it is, therefore, proper, in such cases, to make a very careful examination. For this purpose it is necessary to cut at both ends of the wound quite through it, so that the fingers may pass freely from one side to the other.

Some practitioners have employed setons in such cases, but they are very useless and injurious. The proper treatment is, to introduce, very gently, lint into the wound, and to cover the limb with compresses wet with a solution of salt and water.

When a bone has been severely bruised it will probably exfoliate, and we should prevent the wound from healing until this tedious process is accomplished. We know of no remedy which accelerates it. If the internal membrane of a bone be like to suppurate, acute and fixed pain will be felt in the bottom of the wound; its lips will become extremely sensible, the granulations flabby, fever will supervene, and pus run along the bone below the periosteum. In this case it is proper to trepan the bone, so as to give vent to the matter. If the depth of the bone render this impracticable, we must amputate.

In severe gun-shot wounds the first thing for the surgeon to determine is, whether he should amputate immediately. In the following cases amputation is indispensable.

I. Where a limb is entirely or almost separated.

1st. If we consult experience, we shall learn, that most persons die that are so seriously injured, when amputation is not performed, and that of the small number which escape death, most of them attain very imperfect cure after a great length of time.

2d. The wound, by its irregularity, its extent, the number of parts which have been deadened, the split and splintered bones, the general shock which the limb has sustained, and especially that of the joint immediately above the wound, is necessarily followed by a train of very dangerous symptoms.

3d. What reasoning makes plain, daily observation confirms; for extreme inflammation and gangrene are almost the necessary result; or perhaps an excessive suppuration, con-

vulsions, delirium, or even tetanus ensues. If the wound be near an articulation, matter collects within it. If the patient escape all these accidents, he remains with a deformed, painful, and useless stump, which is frequently covered with incurable ulcers.

There can be no doubt of the propriety of amputation in these cases. It should always be performed through sound parts. If the wound be near a joint, we should amputate above it.

II. When one or both bones of a limb have been broken, and the soft parts are jammed, contused, and torn, in such a way that gangrene, or very violent inflammation must result, and become probably fatal to the patient; or if the principal artery of a limb be opened, and cannot be tied, all attempts to preserve the limb would be alike contrary to the rules of surgery and the dictates of humanity.

It must, at the same time, be confessed, that gun-shot wounds, with extensive fracture of the bone, and enormous contusion and laceration of the soft parts, have done well without amputation. In the *Memoirs of the Royal Academy of Surgery*, Boucher relates several such cases; but surgeons have often to repent that they have not amputated.

We cannot undertake to decide, in an absolute manner, the cases in which amputation is proper, and those in which we should trust our patient to the resources of nature; we shall offer some considerations, however, which may aid the young practitioner in these difficult cases.

1st. To avoid amputation in these instances, it is necessary to make large and deep incisions indiscriminately in every direction, in order to extract the splinters and other foreign bodies. Now, these incisions are quite as dangerous and painful as amputation itself.

2d. These incisions, and all the other assistance of art, do not generally preserve the patient from severe inflammation, gangrene, and death.

3d. Most of those who escape this first class of accidents, die in consequence of the absorption of the pus, or by the long-continued pains, want of sleep, and copious suppuration, unless we prevent this fatal termination by the operation we at first rejected.

4th. The broken part of the bone, or bones, may be large; the extraction of scales may leave between the ends an interval too great for the re-establishment of their continuity. In such a case, the limb would be a burthen to the patient.

5th. Moreover, it is certain that a cure is never effected until after a very long time, commonly several years; and,

even then, an incurable fistula frequently remains; oftentimes the limb is atrophous and deformed; generally less useful than an artificial limb. We might add to these considerations, the necessity of transporting the wounded in rough carriages.

Amputation being judged indispensable, ought it to be performed immediately, or to be deferred? This question was formerly agitated in the Royal Academy of Surgery, which proposed a double prize, that was bestowed on Fauré, in 1756. This author decided against immediate amputation. "We must wait," said he, "until the symptoms moderate, if we expect success." Boucher, on the contrary, contends that amputation should be performed as soon as possible. All great surgeons of the present day have decided with Boucher, and their practice is founded upon the following considerations:—

1st. It has been objected, that amputations, performed immediately after the accident, are almost always fatal, because, say they, the patient is disturbed and agitated by the shock he has just received; but this objection falls of itself, since the patient is always in a state of stupor and insensibility, which spares him part of the pain of the operation; and the operation itself substitutes a simple wound for a great extent of contusion and laceration which the patient has received.

2d. Supposing, however, sufficient time have elapsed since receiving the wound, for the shock and stupor to have almost subsided, and the irritation of the nervous system have already appeared, without doubt this irritation would be augmented by the operation; but this irritation may be opposed by antispasmodics and sedatives; the sensibility may even be deadened by narcotics.

3d. The superabundant force of the patient, and the violent inflammatory state consequent upon it, are not obstacles to amputation: the one may be diminished, and the other prevented, by bleeding during the operation, and the subsequent use of emetics.

4th. It is evident, by immediately making the amputation, the patient is saved from long suffering, and all the complications generally attendant on wounds of this kind, and which frequently cause death.

5th. It is not less evident that, by delaying the operation, the numerous and serious accidents will not be less than by immediately performing the operation. In vain it is pretended to save the patient from pain; those he experiences are longer, and not less acute than those caused by the am-

putation, and the irritation of the nervous system is not less excited. It is, therefore, indispensable, as we have already said, to amputate as soon as possible. In fact, it is necessary, as well for the extraction of foreign bodies as to unbridle the wound, to make extensive and profound incisions, often as painful as the amputation itself, and not less capable of adding to the already existing irritation; beside, notwithstanding these incisions, there is always an excessive inflammatory swelling, frequently followed by gangrene; so that almost all the wounded perish in the first period of the disease, and those who remain are exhausted by suppuration, while waiting a painful and uncertain operation that has become indispensable, to rid them of a limb which cannot be preserved but at the expense of their lives.

6th. If, to all these considerations, we add, that almost all the wounded that have a limb fractured, must be transported several leagues on carts or waggons, the jolting of which pushes the points of the fractured bones against the flesh, causes excruciating pain, and augments the irritation, so that the inflammatory swelling becomes excessive, gangrene almost inevitable, and death certain,—it will, doubtless, be proved, that always, when possible, amputation should be immediately performed.

The observations of Fauré, inserted in the *Memoirs* of which we have been speaking, are not a sufficient reason for preferring delayed to prompt amputation, when the preservation of the limb is judged impossible. But, when it is impossible to give the necessary help to the patient immediately, or a short time after the accident, and the inflammation has come on, with considerable fever, and a hard and frequent pulse, recourse ought not to be had to amputation; it would augment the disease, and might cause the death of the patient. In this case we must temporize; bleed the patient according to his strength, and the nature and tendency of the wound; take out the splinters, and other foreign bodies that are easy to extract, and wait the efforts of nature. Finally, if gangrene take place, never perform the operation until nature has formed the line between the live and dead flesh. Thus, then, in gun-shot wounds, when it is judged impossible to preserve the limb, amputation ought to be immediate, if the primary accidents be not already developed.

It is true, in following the principles we have laid down, we risk depriving the patient of a member, that might be preserved by deferring the operation; but this consideration ought not to prevent it; for, in not immediately amputating

when the case required it, for a few limbs saved, many patients would perish, whose lives would have been preserved by immediate amputation.

When a wound has been made by a musket-ball, and it is not necessary to transport the patient, and the preservation of the limb is worth attempting, we are to begin by enlarging the place of the entrance and exit of the ball, provided it have come out, by incisions above and below, and extending to the fractured bone; it is better even to carry them somewhat beyond the fracture, in order to decide if the splinters can be maintained in such a position as will give them a probable chance of uniting. Those which do not appear susceptible of re-union should be extracted. The incisions can hardly be too large. After having enlarged the orifices made by the ball, we should study to place them in such a situation as will afford a ready exit to the pus. For this purpose, a counter-opening is sometimes necessary to be made in a depending part.

The limb is now to be placed as in case of compound fracture; the wound is to be gently filled with dry lint, and covered with compresses wet with a resolvent fluid; Scultet's bandage and splints are to be applied moderately tight. The next day the apparatus is to be removed, and all the lint is to be taken away that can be easily detached; and upon that which remains adhering to the wound, are to be placed small dossils covered with simple cerate, and, over all, an emollient poultice. The following days, the dressing is to be changed every twenty-four hours. When the bone is surrounded by large masses of flesh, we must be careful not to separate them too far by the interposition of lint, before suppuration has drained the parts, and facilitated the extraction of all the detached pieces of bone; at the same time, the patient must be put upon very low diet, be bled according to circumstances, use cooling drinks and anodyne applications.

In spite of the best efforts of art, gangrene sometimes ensues. If it reach the trunk, the patient dies about the seventh or eighth day after the accident, sometimes earlier; if, however, the gangrene be confined to a limb, and extend deeply, amputation must be performed as soon as the line of separation appears.

The case of which we have spoken is rare. Most frequently suppuration comes on, and the inflammatory symptoms subside, but still the issue of the case is doubtful.

Although the pus be abundant, if of good quality, and if the granulations are firm and vermilion, there is reason to

hope the patient will recover in three or four months. The patient is to be supported by bark, wine, and a generous diet. Sometimes the wound heals before the fracture is consolidated; abscesses subsequently form, and splinters of bone, and other foreign substances, are discharged; but it is more common for the wound to remain fistulous. The joints usually remain stiff for a long time. Motion may be restored, by pouring warm water, especially mineral water, on them, provided no muscle or tendon have been destroyed.

But these cases do not always terminate so favourably. Sometimes abscess after abscess appears in different parts of the limb, the constant presence of pus prevents the bone from uniting, hectic fever and colliquative diarrhœa appear, and the patient sinks under marasmus. If matters seem to be taking this turn, in spite of our best endeavours, amputation is then the only resource: fortunately it is a safe one, since we have little to fear from inflammatory symptoms.

Besides simple wounds, or wounds with a fracture of a bone and considerable laceration of soft parts, the different bodies projected by gunpowder may produce a still further injury, viz. a contused wound, without apparent division of the skin, and even sometimes without change in its colour.

It is now acknowledged, that this kind of injury does not depend, as was formerly believed, upon the percussion of the air, strongly impelled against the part by a cannon-ball; the ball itself produces the contusion. A spherical body, moving with great velocity, may strike so obliquely as to cause an injury (and that without affecting the skin) proportioned to its mass, celerity, and the extent of surface on which it acts. Sometimes there is only a slight laceration of the subcutaneous cellular tissue, and the small vessels which ramify through it. The blood which flows from these vessels, causes an ecchymosis, more or less extensive; or, collecting into a mass, forms a soft, circumscribed tumour. These injuries mostly arise from cannon-balls, which occasion very great contusion. In most cases, the muscles are bruised, torn, and reduced to a jelly: their remains, together with those of the vessels and nerves which passed through them, as well as the fluids they contained, and those which are brought from all parts, form, under the teguments, a collection of matter, which resembles very thick lees of wine.

In other cases, the disorder extends so far as to lay bare the bones, and to deprive them of their periosteum; and even sometimes the strongest of the bones, as the femur and

humerus, are broken and ground to powder. These effects are thus to be explained.

When a spherical body, moving with great velocity, strikes the skin very obliquely, this pliable membrane yields, and flies from the wounding body; its internal surface is pressed against the subjacent flesh, which serves as a sort of cushion to it. Thus its tissue escapes uninjured; but the soft and flexible flesh, pressed against the hard bones, receives the whole shock, and is more or less bruised and lacerated; and if the ball touch the limb by a small surface, and move with great momentum, it almost always fractures the bone.

The curative indications of contusion, without breach of surface, vary according to the violence of the accident. In the first case of which we have spoken, that is to say, when the subcutaneous cellular tissue remains unbroken, we may hope to discuss the ecchymosis, or collection of blood, by the ordinary resolvents; but when the muscles are torn, and reduced to a jelly, and the tumour formed by the destruction of these organs, and by the effused fluids, is large, circumscribed, soft on the centre, and elastic at the circumference, it must be opened without delay. The wound which results from the opening, must be treated like any other suppurating wound. Certainly, in this case, we should lose precious time, if we waited for the tumour to dissipate, and the delay might give rise to serious consequences. When there is fracture without any external wound, it comes under the head of Gun-shot Wounds, with fracture of the bones; of which we have spoken.

What we are going to say of gun-shot wounds applies to those of the extremities; but as they also affect the large cavities, and injure internal organs, they offer peculiarities, which we shall treat of hereafter.

ARTICLE VI.

Of Lacerated Wounds.

This term is given to such wounds as are produced by the entire tearing off of a part of the body. Examples of this kind are not unfrequent: we find several such cases in the second volume of the *Memoirs of the Royal Academy of Surgery*. A finger, a hand, an arm, a leg, or even a shoulder, may be torn off by a force which acts at a greater or less

distance than that which yields. A wound varies in its form and extent, according to the parts which have been torn off, and the manner in which the accident has taken place. It is easy to conceive, that no part of the body can be torn off without extreme tension of the muscles, tendons, vessels, &c.; and as these parts are not capable of elongating themselves to the same degree, and as the force does not act equally upon all, it follows that, as they yield one after another, they form an irregular wound, with several angles.

Lacerated wounds are rarely followed by hemorrhage, even if the part torn off, as the arm or leg, receive arteries of large size. The bruising of the artery, the unequal elongation of its fibres, the irregular rupture of its coats, its retraction (the necessary consequence of its elongation and its elasticity), and the retraction of the muscles and other soft parts irregularly torn, are undoubtedly the causes that prevent hemorrhage in these kinds of wounds.

The treatment of lacerated wounds is very simple. If there be flaps of flesh, tendons, or aponeuroses, which pass beyond the surface of the wound, and cannot be re-applied, so as to unite by the first intention, or by granulation, they are to be cut off, in order to give the wound a more regular form, and thus to effect its speedy cicatrization. In other respects, the conduct of the surgeon must be regulated by the nature of the accident. Generally this sort of wounds must be healed by granulation. If there be hemorrhage, the bleeding arteries must be tied or compressed; the wound is then to be dressed with dry lint; the patient must be bled, and put upon low diet, according to the extent of the injury. If inflammation supervene, it is to be treated by the ordinary means; and when it is dissipated, and suppuration fully established, it is proper to proceed as in simple wounds.

ARTICLE VII.

Of Wounds occasioned by the Bites of Animals.

These are of three kinds : those caused by healthy animals, by poisonous animals, and by rabid animals.

SECTION I. *Of Wounds made by healthy Animals.*

These are referable to the class of wounds made by puncture, contusion, or laceration. They are sometimes attended with serious consequences, which were long believed to arise from some malignity of the bite ; but they are to be attributed to the violent laceration and the severe bruising of the muscles, tendons, nerves, vessels, teguments, and even bones, particularly if the animal be large and enraged. Nevertheless, the subsequent symptoms are not always in proportion to the size of the wound : there are examples of very small bites which have been followed by excessive tumefaction and gangrene, without doubt occasioned by the pricking, puncture, and laceration of the nerves ; while others, much larger, in which the flesh was rather cut and removed by the teeth of the animal, than mashed and torn, have healed without any bad symptoms.

In the treatment of these wounds, the first indication is to prevent inflammation, and to combat it when it takes place ; for this purpose it is proper to employ emollients and anodynes, diet and bleeding, according to the nature of the case. When the bones have been broken, we are to proceed as in compound fractures.

SECTION II. *Of Wounds made by poisonous Animals.*

Of all the animals to the bite or sting of which the inhabitants of France are exposed, the viper alone is really venomous.* This reptile, which is often confounded with the adder, is rarely more than two feet long, and an inch in diameter ; its skin, which is scaly and shining, is of a blueish ash colour, or reddish grey, very deep on the back, and lighter at the sides, with black spots of an irregular form, in regular order.

The upper jaw of the viper contains two teeth, very different from the others ; they are about three lines long, and

* See note K.

almost surrounded by a dense membrane, terminated by a ridge, frequently indented. They are curved, articulated to the jaw, moveable forwards and backwards, and turn back when the animal is quiet, and his mouth shut, but are raised when he opens it to bite. These hooked teeth are pierced by a canal which terminates at some distance from the point, upon the convex part, by a small opening.

The canal is commonly filled with a transparent yellow fluid, which is the poison. This venomous liquor is separated from the blood by two glands, or rather by two collections of glands, one on each side of the head, situated at the anterior part of the sinciput, directly behind the globe of the eye, under the muscle which depresses the lower jaw; so that this muscle cannot act without pressing upon them, and consequently facilitating the secretion of the liquor they contain. A vesicle attached to the base of the first bone of the upper jaw, as well as to the extremity of the second, and which covers the roots of hooked teeth, forms the reservoir for this fluid.

When the viper is about to bite, he opens his mouth wide; his two hooked teeth become raised up perpendicular to the lower jaw. When the bite commences, the poison is thrown into the teeth by the contraction of the muscles.

The bite of the viper is soon followed by local and general symptoms; but the former take place first. The patient experiences, at the moment of the bite, an acute pain, like a shot from a gun, which extends throughout the whole limb, and even to internal organs. Very soon the wounded part swells, and becomes red; sometimes the swelling is confined to the neighbourhood of the wound, but more commonly it extends far, and soon affects the whole limb, and even the body. Frequently there distils from the wound a sanious fluid, and blisters are raised about it, as in a burn; but shortly afterwards the pain greatly diminishes, and is succeeded by an edematous, doughy softness; the part becomes cold, and the skin covered with a great number of livid gangrenous spots. The general symptoms quickly appear; the patient becomes anxious, respiration is difficult, with great weakness and copious cold sweats; the pulse is depressed, small, and irregular; the eye is ghastly, and reason lost. Frequently vomiting comes on, with copious bilious discharges per anum; cold sweats, and almost always universal yellowness, and severe pains about the umbilicus.

The symptoms follow nearly the same course in all cases, with such differences only as depend upon the sensibility and temperament of the patient, the size and anger of the

viper, the number of bites he has made ; the depth of the wound, especially if in a part plentifully supplied with nerves, is likewise to be taken into consideration. In general, feeble, cachectic, pusillanimous persons, and those with full stomachs, are affected more promptly, and more seriously, than strong vigorous men, who look on danger without fear ; it is also remarked, that the poison of the viper is more active in summer than in spring.

Moreover, whatever be the violence of the symptoms that accompany the bite of a viper, it is far from being so dangerous as has been imagined : it is very rarely fatal ; and in cases in which it is so, death is produced by a large quantity of poison, several bites in the vicinity of vital organs, and the want of proper assistance. In cases of a single bite on a limb, patients usually get well without medical aid, but more slowly than they would with it ; and it is thought that the poison may impart a long-continued and serious impression to the constitution. We are, therefore, not to neglect the due employment of the proper remedies.

A number of nostrums have been employed for the cure of the bite of a viper. Every one of these, in the opinion of its advocate, has produced wonderful cures, and yet each has been successively abandoned for a later remedy. Most of these medicines, although possessed of opposite qualities, cure, or seem to cure, the patients ; of course, every person believing he has a right to cry up his specific. But the real cause of this pretended efficacy is, that the bite of a viper is very seldom fatal to a grown person.

Without noticing the numerous specifics for the bite of a viper, we shall simply lay down the treatment which reason and experience have proved most efficacious. The means of cure are local and general.

The local treatment consists in destroying the part where the poison has been deposited, and arresting the irritation it creates in the nervous system, and which appears to be the cause of all the symptoms. This may be effected by the actual cautery, or by caustic ; but the last is most commonly employed, because it is equally certain, and less alarming to the patient. Fontana prefers the kali purum : he is convinced, by a great number of experiments, that it is truly a specific ; but any caustic will produce the same effect, which destroys the reservoir of poison. Liquid caustics are now generally preferred ; such as the liquid muriate of antimony, sulphuric and nitric acids, because they act more quickly, and penetrate more certainly to the bottom of the wound.

When a person has been bitten by a viper, and no very urgent symptoms have appeared, a piece of thin pointed wood is to be dipped into a liquid caustic—the muriate of antimony in preference; the point is to be introduced into the bite; a dossil of lint, as large as a pea, is then to be wet with the same, and kept applied to the wound with sticking-plaster. This will be sufficient in the great majority of cases. The muriate of antimony quickly produces an eschar, which includes the poison, and arrests at once the local irritation and the general symptoms consequent upon it. But when the symptoms are urgent, the wound small and deep, and there is reason to fear that caustic, applied in the manner we have recommended, will not reach all the parts which have been exposed to the action of the poison, we must then enlarge the puncture with a bistouri; and having wiped away the blood, the caustic must be applied, and a small dossil of lint, wet with it, put on the bottom of the wound, and kept on by a suitable bandage. In this manner we are certain of destroying the poison, and the irritation consequent to it. At the expiration of several hours, the wound is to be dressed with olive oil, or an emollient camphorated cerate. Very soon after the application of the caustic, the pain diminishes, and the other symptoms moderate; sometimes they even cease the instant of its application, and local inflammation alone remains. This is dissipated, by covering the part with a poultice of bread and milk, with the addition of weak volatile liniment. The little wound made for the application of the caustic, suppurates, and the suppuration contributes still further to remove the swelling. When it has entirely subsided, the ulcer is to be treated as a simple sore.

The bite of a viper does not always require such severe local treatment. When it is superficial, and has been made by a viper stiff with cold, or whose venom has been expended by previous bites, and the swelling is inconsiderable, and the patient feels well at heart, it is sufficient to drop into it a few drops of aqua ammoniæ, to cover it with a compress wet with the same, and then to rub the limb with olive oil. If this be not at hand, we may substitute for it butter without salt, or fresh lard. The oil of olives, recommended by the English, and afterwards by Pouteau, has no specific virtue, as has been proved by Hernaud and Geoffroi.

Although, in general, local treatment be sufficient to arrest the symptoms resulting from the bite of a viper, we are not to neglect internal remedies. Stimulating cordials and volatile alkaline salts are most proper. The ancients made

great use of the theriac of Mithridates, of the salt of vipers, or, in place of it, of the sal cornu cervi; and these remedies generally succeeded; but the aqua ammoniæ, or the eau-de-luce, (which is the same thing, with the addition of a few drops of the oleum succini,) is the most efficacious remedy; it has been justly regarded as a specific since the time of Bernard de Jussieu, who relates the following case, in the History of the Academy of Sciences, for the year 1747.

“ The 23d of July, 1747, Bernard de Jussieu was botanising with his pupils on the heights of Montmartre; one of them grasped in his hand a snake, which he took for an adder, but which was really a viper. The enraged animal bit him in several places; his fingers quickly swelled, and tumefied; his hand became so enlarged, that he could not bend his fingers. Jussieu fortunately had in his pocket a vial of eau-de-luce; he gave the young gentleman six drops in a glass of water, and dropped some of it into each bite. It was then one o'clock, and the day was warm; at two the patient fainted. It was proposed to put a ligature on the right arm, which was greatly swollen; but Jussieu forbid it. He gave a second dose of the eau-de-luce in wine, which relieved his weakness. He desired to be carried to a house. On the road he fainted twice. When he was put to bed, he vomited up his dinner, and was delirious; but these symptoms yielded to further doses of the eau-de-luce. He slept well during the night; on the next day he was better, but incommoded by profuse sweating, which the medicine had excited. He passed the second night well, but the swelling remained. Sweet oil, with a small proportion of aqua ammoniæ, was rubbed over it; half an hour afterwards he could bend his fingers easily. The next morning he dressed himself, and came to Paris, after having breakfasted well. He was cured in eight days. A swelling of the hand, and a yellowness, which had appeared on the third day, were dissipated by the same remedy, of which he took two drops twice a-day.”

Since the time of Jussieu, the aqua ammoniæ has been constantly used, and always with similar success. United to oil, the ammoniæ is a powerful resolvent; dropped pure into the wound, it acts as a gentle caustic; taken internally, it is a diffusible stimulus, which imparts strength, restores the secretions, and especially produces abundant perspiration. Four or five drops every two hours, in some pleasant diluting drink, are sufficient for a delicate and sensible person; the more robust require twelve or fifteen; but we must not exceed this dose, lest we injure the coats of the

stomach. The doses are to be diminished as the symptoms abate, and gradually left off.

The patient must be put to bed, and well covered; he may take a dish of tea, or some similar drink; and when the perspiration begins, we must not uncover him to dress his wounds, or give him drinks that would check it; nevertheless, the bites must be often dressed. For the first days, the patient should take no other nourishment than a few glasses of good wine; afterwards, when he becomes hungry, he may have soups and solid food.

SECTION III. *Of Wounds made by rabid Animals.*

This sort of injury is much less important, in relation to the wounds themselves, than to the terrible disease to which they give rise, if we do not employ, in due season, the proper prophylactic means. The nature of this terrible affection, which is generally called *rabies*, on account of the paroxysms to which the patient is subject, is little known; that of the virus which causes it, still less so. Rabies is a kind of nervous malady, which produces an alteration of the saliva, by which the bite of an affected animal communicates the disease. As rabies is almost always attended with a dread of water, it has received the name of hydrophobia; but this term is not well applied; for dread of water is a symptom of several nervous diseases, and, moreover, it does not uniformly occur in rabies; of course, it cannot form an essential part of the disease.

There are two kinds of rabies, viz. that which arises spontaneously, and that which is communicated: we here treat only of the latter.

We cannot know, by the appearance of a bite, whether it have been made by a healthy or a rabid animal; nevertheless, this knowledge is of the greatest importance, because we can easily prevent the disease, but cannot cure it. Daily experience teaches us the difficulty of attaining this knowledge; the following considerations, however, are worthy of notice: If the enraged animal be a wolf, and he have bitten several creatures without eating them, it is presumable that he is rabid; if a horse or ass, which before had no disposition to bite, and which has been bitten by a cat or dog, we can hardly doubt that he is affected with rabies. As to dogs, as they are subject to several kinds of diseases beside rabies, which, however, are often confounded with it, and these animals generally impart it to men, it is essential to learn, as soon as possible, if a dog, who has bitten one or more per-

sons, be mad or not. These are the symptoms of madness in those animals :—

At first the dog appears sad and downcast; he hides himself in a corner, and loves obscurity and solitude; he does not bark, but often growls without cause, and especially at the sight of strangers; still he knows his master, and caresses him; he refuses drink and food; if he move, he staggers, and appears to be asleep. This state commonly continues two or three days; but, as the disease advances, he quits his master's house; he carries his head low, his hair erect, his tail between his legs, and his eye fixed and glassy; his mouth is full of frothy saliva; he runs every way; his progress is uncertain, sometimes slow and sometimes precipitate. If he meet another dog, he pursues him; and if he can catch him, he bites, and then appears satisfied. He experiences paroxysms of madness, which return at irregular intervals; he then seizes every thing that approaches him, even his master is not spared; he does not bark; water, light, and colours, excite his fury; his limbs are agitated by convulsive motions. Two or three days after having quitted the places he has been accustomed to, he dies; his body soon decomposes, and exhales a fetid odour.

Such are the symptoms we observe in a rabid dog: they are nearly the same in all animals. Depression, sorrow, and refusal of ordinary food, characterize the first stage of the disease; paroxysms of rage, delirium, and a desire to bite, dread of water, and a ropy, frothy saliva, mark the second. But rabies sometimes presents some varieties, which it is important to distinguish. For example, the dread of water appears to be the most invariable symptom in all animals; nevertheless, rabid wolves and dogs have been known to drink plentifully after having bitten persons; they have even passed over rivers, and turned out of their way to bite men working in water. We should, therefore, woefully deceive ourselves, if we neglected wounds made by animals who discovered no dread of water.

If a dog have bitten one or more persons without provocation, and be kept several days, and die, after having experienced many of the symptoms we have detailed, there can be no uncertainty as to his case—the dog is rabid; but often he escapes, or is killed on the first suspicion; and then it is more difficult to know what has been his situation, because, in the country, they regard as rabid, every dog who, having lost his master, runs through a village, and perhaps bites some one whom he finds in his way. In this case,

whether the dog be killed or escape, it frequently happens, that the person who is bitten remains in the most cruel uncertainty. It is important, therefore, to ascertain if the animal were merely frightened, or really rabid.

When the dog escapes, there is no method of discovering his situation; but when he has been killed, several means have been proposed to acquire this knowledge. It has been advised to soak a piece of bread, or meat, in the blood and other fluids that flow from the wound, and to offer it to another dog. If he eat it, we may make ourselves easy as to the nature of the wound; if otherwise, there is no doubt that the wound has been made by a rabid animal. Although this means is recommended by many writers, it does not appear to deserve any confidence; for a hungry dog will eat bread that has soaked in the fluids of a wound; and, moreover, the virus of rabies, which rests in the bitten part, is not always diffused in the blood; and if it were, its quantity is too small for a dog to discover it, notwithstanding the acuteness of his olfactory nerves.

J. L. Petit advises, from his own experience, to rub the jaws, teeth, and gums of the killed animal, with a piece of cooked meat, which is then to be offered to another dog. If he refuse it, crying and howling, we may believe, says he, that the animal was mad; but if the offering be well received, there is nothing to fear. This experiment is more reasonable than the former; it may inspire confidence to a timid and anxious patient, and ought always to be practised; but if the slightest suspicion remain, it is proper always to endeavour to prevent the disease.

Commonly men become rabid in consequence of the bite of an enraged dog, or other animal. The poison which communicates this disease, is contained in the saliva, and is deposited in the wound by the teeth of the animal. But this is not the only way in which the disease may be communicated; authentic cases prove, that the mere application of the saliva, or the slaver, of an animal to an excoriated part, or a part covered with thin epidermis, as the lips, may occasion rabies; it is even pretended that the saliva, dried upon linen or clothes, may produce the disease, after a great length of time; and the fact, however extraordinary, appears to be confirmed by several cases. Although these facts have been denied, they are entitled to the greatest respect. When an enraged animal has committed ravages in a country, if his saliva have touched any clothes, they should be washed with care; the straw on which he has slept should be burned, as well as other substances that are infected with

the poison. If he have been confined in a chamber, the floors should be cleansed, and the walls white-washed. Finally, those who touch the body of the animal, should wash their hands with vinegar, and be careful not to touch their lips or faces.

The presence of this poison in a wound, produces no primary effect, offers no obstacle to its cure. The wound, if left to nature, or treated in the ordinary manner, heals as well as any other similar injury; the disease is not developed until it has remained dormant for a considerable length of time. Sometimes it appears at the expiration of two, three, or six months. Galen saw it take place at the expiration of a year, and Mead after eleven months; but commonly it shows itself in thirty or forty days; sometimes sooner, especially in young persons, who are occasionally attacked at the end of seven or eight, but more commonly, of fifteen or sixteen days. We have, however, seen a child of ten or twelve years of age, die of rabies, at the hospital Charité, eleven months after the wound which communicated the disease. These varieties depend upon the temperament of the person who is bitten, the violence of the disease in the rabid animal, and the situation of the wound. Lively passions and extreme heat appear to favour the development of this terrible malady. Many persons appear little susceptible of the hydrophobic virus, and some have been bitten by rabid animals, without being affected with rabies.

These are some of the symptoms which characterize this disease:—Pain is felt in the part that has been bitten, which insensibly increases, and extends to the neighbouring parts; the scar becomes red, black, and swollen; sometimes it opens, and discharges a reddish serum; or if the wound have not closed, the granulations inflame, and discharges thin reddish pus. As the wound is the receptacle of the poison, it is not surprising to see the symptoms commence in the part which has been bitten; nevertheless, there are instances of persons who have died of rabies, and in whom the wound or cicatrix has undergone no change.

The local symptoms we have described are quickly followed by sadness and melancholy; the patient's complexion undergoes a remarkable alteration; the sleep is interrupted by frightful dreams, which relate particularly to the accident he has met with; sometimes he imagines himself surrounded by dogs that are ready to devour him, or falling from the brink of a precipice; he often experiences a general horripilation; he feels a sense of heat; a kind of shud-

dering, which extends from the wound to every part of the body, and seems to terminate more particularly in the chest and throat; the pulse is weak, small, and locked. The symptoms quickly increase; a severe nervous fever appears, attended by a burning heat and uneasiness in the epigastrium; frequently the patient vomits green poracious bile; his countenance is red, his aspect fierce and astounded; respiration difficult; the pulse hard, tense, strong, and hurried; involuntary groans and deep sighs are heard; the unhappy sufferer experiences an invincible repugnance to liquids, or, if this do not exist, the convulsed state of the muscles of the pharynx prevents him from swallowing; but most commonly the dread of water occurs; the eyes are glassy, and the pupils dilated and immoveable; the sight of polished and shining bodies causes a shuddering, which makes him avoid them; convulsive movements soon come on, and even well marked paroxysms of rabies are renewed by the motion of the air, by light, and acute sounds; a constant desire to spit, and bite, is added to these symptoms. This propensity seems to be irresistible; but most frequently the patient who experiences it, has sufficient presence of mind to caution persons not to approach him during the paroxysms. At length, to all these symptoms, which mark rabies in the highest degree, succeed a general debility and complete exhaustion; the pulse becomes small and tremulous; the extremities cold; and death terminates the dreadful scene on the third or fourth day; sometimes sooner, rarely later. Dissection discovers no trace of the hydrophobic virus, no constant alteration in any of the organs essential to life; sometimes merely a slight redness of the pharynx; and, even then, it is difficult to determine if this be a natural or morbid state of the parts.

Any wound made by the teeth of a rabid animal is dangerous; but these injuries are more or less so, according to the circumstances which accompany them. For example, a small wound, which has bled much, and which cannot heal without freely suppurating, is less to be dreaded than a deep wound, which heals quickly. A superficial bite is not so dangerous as one which has penetrated through the skin: the treatment of it is more simple, and more certain. The same remark is applicable to a wound made by a timid and feeble animal, who is in the first stage of the disease. But, *cæteris paribus*, those wounds are most to be dreaded which are inflicted by enraged animals, and near the salivary organs, especially if there be several, and the parts bitten were uncovered; for, since the virus certainly exists in the

saliva, it is easy to conceive that a part covered with clothes, especially if they be thick, is greatly protected; for the saliva is wiped from the teeth of the animal before it can reach the skin. The wound is, moreover, least dangerous in strong and courageous persons; it has been even said, that persons of this description have been bitten by rabid animals with impunity. But it is universally allowed, that rabies is a dreadful affection, and so easily communicated, that when a person has been bitten, even though we be not certain that the animal was rabid, every means should be resorted to that can tend to prevent it. Lastly, there are some wounds by rabid animals, which are of themselves essentially dangerous, and almost uniformly fatal, because the proximity of large vessels prevents a sufficient cauterization of the part in which the poison is deposited. Such, for example, is a wound near the carotid or crural artery.

In the treatment of bites of enraged animals, the principal object is to remove or to destroy the virus before it affects the system. With this view, some practitioners have advised the extirpation of the whole bitten part; but this means is very painful, produces a great deformity, and requires very often great dexterity and exact anatomical knowledge; and, even then, is sometimes impracticable. We may effect this object in a way equally sure, and less painful, by disorganizing deeply all the parts on which the poison has been deposited; or, what amounts to the same thing, convert them into an eschar, and thus insulate them, as it were, from the rest of the animal economy. These means have always succeeded, in the hands of attentive practitioners, in preventing rabies, especially when the supuration of the wound has been kept up for a long time.

The use of red-hot iron was familiar to the ancients, who uniformly applied it to the bites of rabid animals, and success constantly attended their practice. As most patients have a repugnance to the actual cautery, it has been proposed to substitute for it boiling oil or gunpowder, or to burn a piece of cotton on the part; but, in general, caustics are preferable to the actual cautery, except in wounds of the mouth, to which it is exclusively applicable. The cauterization with a red-hot iron is not very painful, nevertheless few will submit to it; moreover, it may be ineffectual, if the wound be not cauterized throughout its whole surface, deep enough to destroy the poison. We are not, therefore, to have recourse to it, except for the want of other means, and in the case of which we have before spoken.

Caustics have not the same inconveniences; they are less

alarming to patients, more sure, and more manageable. All caustics may be used; caustic potash, nitrate of silver, nitric, sulphuric, or muriatic acid, and muriate of antimony, answer the purpose sufficiently well; but the last is preferable. It is found in two states—solid and liquid; the former is extremely active; it burns as strongly as a live coal, but it quickly becomes moist and soft in the air; and if it should break in the wound, and we should not be able to extract it, its action perhaps might extend further than would be proper. The liquid muriate of antimony is somewhat less active, but is more manageable; it possesses every quality we can wish; but, if other caustics be not at hand, we may prepare a very good one, by mixing an ounce of fresh quick-lime, reduced to powder, with as much soap, which form a kind of paste.

Next to the liquid muriate of antimony, caustic potash appears to us best. It is applied in this manner: If the surface of the wound be small, put upon it a piece of the potash, of a size proportioned according to the eschar which you wish to produce; cover it then with dry lint, and bind the whole down tightly with adhesive plaster and bandages. But if the surface of the wound be large, the caustic is to be broken in pieces, and laid on several parts; or it may be grated on the wound. At the end of three or four hours, a black eschar is formed, several lines thick.

Liquid muriate of antimony is thus employed: A kind of pencil is to be formed with a piece of linen rolled on a thin piece of wood, with a string wound around it; this is to be dipped in the caustic, and pressed on the surface of the wound several times successively. A white eschar is thus formed in a few minutes, which is scarcely two lines thick. If you wish it to act more deeply, a pledget of lint is to be dipped in the caustic, and kept on the wound for three or four hours. The success of this treatment depends upon the entire destruction of the virus; we should, therefore, be careful that no part of the wound escape the action of the caustic; for if the smallest portion remain in the wound, rabies may be produced.

We shall now proceed to the detail of the treatment of the rabies, and lay down the modifications which it ought to undergo, according to circumstances.

When we are called to a person who has been bitten by a rabid animal, we should wash the wound, as quick as possible, with a solution of salt, soap, or vinegar and water, in order to dissolve and carry off the poison; we may also employ lie. We should not fear to irritate the wound by long-

continued and repeated washings ; it should be rubbed with hard linen, so as to press out the blood, and discharge the fluids which the parts contain. If the wound bleed much, it must be filled with dry lint, and the application of the caustic must be deferred until the hemorrhage cease. The washes should always be applied warm, that they may be more active. After these essential preparatory steps, we should proceed to that which alone is certain, viz. cauterization of the wound.

If the animal have only slavered on the part, without biting it, or if his teeth have only slightly scratched the surface, it will be sufficient merely to touch the part with muriate of antimony, or to apply a piece of caustic potash ; but if the wound have penetrated through the skin, we must make a crucial or several radiated incisions, and unite them by others from their extremities. Sometimes, when the incisions have been made, we find the skin detached to a greater or less extent, and a portion of the cellular tissue contused and injected with blood : these must be removed. If the wound be still more deep, and penetrate to the muscles, we must enlarge it in every direction, down to the bottom ; and when the bleeding is stopped, apply the caustics. But if the effusion of blood be considerable, and likely to continue for some time, we may wet the lint with some active solution ; and when the bleeding ceases, we may move the dressings, and proceed to apply the caustic. When the wound is considerable, and its lips contused, it is proper to cut them away : if it be angular, we should remove the largest portion of the projecting side. We should never satisfy ourselves with touching the wound with a pencil dipped in caustic—we must place upon it a dossil of lint well soaked therein ; and, lest it spread to the neighbouring parts, it is to be surrounded with small pledgets of dry lint, and the whole covered with a gum plaster, over which we are to put a compress and bandage. The situation of the wound, and the nature of the parts which it affects, demand particular consideration.

If the vicinity of a considerable artery, prevent us from cauterizing so deeply as we wish, we may very safely touch that side with nitrate of silver, and when the eschar has separated sprinkle the whole wound with powdered cantharides. But if the artery be entirely bare, the application of the caustic must be omitted, and suppuration kept up in the wound by cantharides alone. In wounds of the head, the scalp must be entirely shaved, lest a slight scratch escape us. When a tendon or bone is laid bare, we should cauterize

it without fear; it is even proper, previously to rasp the bone. If a lip be divided, the edges of it must be cut away a little below the borders of the wound, caustic is then to be applied, and after keeping up suppuration for forty or fifty days, it may be re-united as a hare-lip. When the eye-brows have been wounded, we must not spare them, but cauterize, and even cut off a part if necessary. The virus is generally more easily absorbed from parts of soft and delicate structure; we are, therefore, not to regard the deformity we may produce, but cauterize deeply, and keep up suppuration a long time. Wounds of the mouth should be examined with the greatest care, and a red-hot iron should be applied to every part with which we even suspect the poison has come in contact.

Sometimes it happens that the wound is healed up before it was known that the animal was rabid. This should not make us despair of saving the patient, for the cause of rabies often remains inactive a long time under the cicatrix; and when the disease has not appeared, it may be destroyed. After having encouraged the patient, we should apply to the cicatrix a piece of caustic potash, or liquid muriate of antimony, large enough to produce an eschar, which shall extend beyond the cicatrix. If the wound have been small and superficial, the application of caustic alone will be sufficient; in other cases it should be laid open, and left to bleed before the caustic is applied.

Cauterization alone, employed in time, and in a proper manner, is sufficient to prevent the disease; but, nevertheless, for the greater security, after removing the first dressing, we should apply a blister much larger than the eschar, and let it remain on twelve or eighteen hours. The application of a blister has the advantage of removing the cuticle from parts that may have been touched with the saliva of the animal, the whole of which may not have been washed away; moreover, it hastens the separation of the eschar, and the copious formation of pus. This suppuration ought to be kept up, for forty or fifty days, by means of an irritating ointment, or a pea, a piece of sponge, or gentian root; but it is easy to conceive that these means would be useless, and even injurious, if the wound be large, deep, and much inflamed, and of a kind to suppurate copiously. In this case we should only use topical emollients to excite suppuration, and heal the wound by simple dressings.

The success of cauterization depends greatly upon the time at which it is made: it is most certain when applied immediately after the accident; nevertheless, it is always

proper, except when the patient is decidedly rabid; and then it would only aggravate the disease, and bring discredit upon the remedy. If the disease, however, be only forming, cauterization may yet save the patient.

Although internal remedies have no direct action upon the virus, they ought not, nevertheless, to be neglected, since they may become useful auxiliaries. They ought to be chosen from the class of antispasmodics and mild tonics. These means are calculated to calm the agitation of the system, and to give the organs the proper tone; thus, placing the patient in the condition most unfavourable to the development of the disease. If the patient discover any symptoms of saburra in the primæ viæ, we must administer an emetic or a purgative, and afterwards an antispasmodic draught.

It is likewise essential to inspire the patient with confidence by amusements of every kind, concealing from him his situation, and promising a cure. Reason and experience alike establish the utility of this moral treatment.

The diet ought not to be too sparing; the patient should take food of easy digestion, and tonic drinks, such as wine and water, bitters, or a decoction of bark, to which may be added a few drops of aqua ammoniæ. These are the surest means of preventing hydrophobia.

But when the disease has appeared, the aid of art is useless, and death is inevitable. Nevertheless, a great number of means have been offered, as well to cure as to prevent the disease. We shall not enter into a discussion of all these remedies, but confine ourselves to the consideration of a few that have been considered most efficacious. Repeated bleedings, aspersions of cold water, salt and fresh water baths, a sudden and unexpected immersion into cold water, antispasmodics, and especially opium, mercury externally applied, and given by the mouth, so as to produce copious salivation, can-de-luce, volatile alkali, oyster-shells, and a thousand other remedies, either inert or possessed of opposite qualities, have each in their turn been confidently recommended, but have gained their character by preventing rabies from following the bite of an animal that was not hydrophobic, or cured a nervous disease, which was mistaken for rabies. The use of these pretended specifics is proper enough after the disease has appeared, but if given before, they inspire a false and fatal security.

Although we have no hope of curing rabies, we should, nevertheless, try every resource that can be devised for this purpose. Rabies does not make a man furious at

once, the symptoms proceed gradually, and most patients preserve their reason to the last; they even warn us of their situation, and suffer themselves to be tied; but what remedies can we give to such patients? As they cannot tolerate a bright light, the view of shining objects, or the slightest noise; and as the idea of liquids alone will cause a paroxysm of rage, they should be placed in a dark and silent chamber; no liquids should be presented to them; we should approach them with precaution, without surprising them; speak to them gently and indulgently, while, at the same time, we give camphor, musk, and opium. If deglutition be impossible, we may give these remedies with injections; though they only serve to blunt the sensibilities of the patients, and to diminish their sufferings, they are, nevertheless, very advantageous.

CHAPTER VI.

Of Tumours in general.

WE give the name *Tumour* to every unnatural eminence on any part of the body. But this word tumour does not apply merely to unnatural eminences which appear on the surface of the body, and there form a greater or less relief; it designates also internal tumours, which arise from the infarction of the cellular tissue, or an augmentation in the affected organ. Tumours present many differences; the principal are those which relate,—1st. To their situation; 2d. To the organs which they affect; 3d. To their material cause, viz. the nature of the substances of which they are formed. In considering tumours in this point of view, they have been distinguished into those which are formed by foreign bodies; those which are formed by the displacement of the solid parts; and into those formed by the fluids, and which are called *humoural tumours*, or *apostumes*.

Tumours formed by foreign bodies ought to be less regarded as diseases, than as symptoms of the presence of these bodies. Thus, when a ball, remaining in a limb, shows itself near the integuments, the tumour it occasions cannot be considered as a disease, but as a symptom which announces the presence of a foreign body: thus, when worms are collected in any portion of the intestinal tube, so as to raise the

parietes of the abdomen, the tumour formed by them is not a disease, but a symptom of a disease.

We shall not here speak of tumours formed by foreign bodies; we shall treat of them in describing diseases according to their anatomical order.

Tumours formed by the displacement of solid parts may be distinguished into those which result from the displacement of hard parts, and those which are caused by the displacement of soft parts.

The hard parts, in quitting their natural situation, form tumours, which, however, as we may readily conceive, are but symptoms of disease. The tumour in the axilla, or under the clavicle, when the humerus is luxated downwards or forwards; that which exists in the groin, when the femur is luxated upwards and forwards, are certainly only symptoms of disease, and the same may be said of all other tumours of this kind: of course we shall not treat of them.

Tumours resulting from the displacement of soft parts, and which are known under the general name of *hernia*, appear only in certain parts of the body; we shall treat of them, therefore, in speaking of diseases, according to their anatomical order: in this place we shall treat only of humoral tumours.

Humoral tumours have been distinguished into those formed by chyle, those formed by blood, and those formed by fluids emanating from the blood.

Under the head of tumours formed by chyle, have been classed those collections of this fluid, which take place in the abdomen, from Piquet's reservoir, or in the breast, if the thoracic canal have been torn, pierced, or broken. But it is evident that this accident, which is extremely rare, cannot form a true tumour, and that it has a stronger analogy to collections of blood, pus, &c. which sometime take place in the same cavities. Some have referred to the head of tumours formed of chyle, the swellings of the glands of the mesentery and mesocolon; but since the system of the lymphatic vessels has become better known;—since it is shown that these vessels open into the intestinal tube, and there perform the functions of absorbents, taking up not the chyle only, but also the lymph, which the exhalent vessels pour out in this tube, it has been deemed more proper to refer this enlargement of the mesenteric glands to tumours formed of lymph. Thus it results from what has been just said, that properly speaking, there are no tumours formed by chyle.

Tumours formed by the blood, are divided into those which

consist of all parts of the blood, and those which are formed by its white parts alone.

The first class are divided into those which are seated in the capillary vessels, and those which form in the large vessels, when the blood is almost entirely governed by the laws of hydraulics: the first, which are called *inflammatory tumours*, are erysipelas, phlegmon, furunculus, anthrax or carbuncle, and malignant pustule. The second are situated in a dilated artery, or in the environs of an open artery, or in the veins; those which are situated in the arteries, or which arise from an opened artery, are known under the general name of *aneurism*; those which take place in the veins are termed *varices*. We shall join to this class of tumours those which have been called *varicose*, or *bloody fungous tumours*.

The white part of the blood is composed of two distinct parts, which may easily be separated, either by means of fire, acids, or alkohol; one of these parts is albumen, or the coagulable part; the other is the serum, properly so called, or the uncoagulable part. These two parts are never entirely separated in the tumours which they form, but sometimes one and sometimes the other predominates, according to the nature of the tumour. The albumen, more or less mixed with the serum, becomes obstructed in the lymphatic glands, in the cellular tissue, and sometimes even in the organic structure of these parts, and produces tumours known under the names of *schirrus* and *cancer*.

The serum forms tumours in two ways, viz. by infiltrating into the cellular tissue, and collecting into one cavity. The infiltration of the serosity forms edema when it is local or partial; anasarca, leucophlegmatia when it is general. The collection of serum into a cavity is known by the general name of *dropsy*; when it takes place in the cranium, it constitutes hydrocephalus; in the chest, hydrothorax; in the abdomen, ascites; in the tunica vaginalis testis, hydrocele, &c. In all these cases the serum is poured out into a natural cavity; but sometimes it collects in a particular sac, formed of cellular tissue; then it takes the name of *encysted dropsy*.

The tumours formed by fluids emanating from the blood, are as various as the tumours themselves; in fact, all fluids emanating from the blood, may form tumours, either by accumulating in the cavities destined to contain them, or in the tubes, which transmit them to these cavities, or which carry them to the surface of the body, either by collecting or infiltrating into the neighbourhood of these tubes when

they are pressed : thus the tears retained in the lachrymal sac, form fistula lachrymalis; the saliva arrested in the excretory duct of the maxillary gland, produces a salivary tumour; the bile contained in the gall bladder forms a tumour, which is perceived in the right hypochondrium, below the cartilages of the rib; the urine retained in the kidneys, the ureters, the bladder, or in the urethra, produces urinary tumours. The same fluid infiltrating into the scrotum and perinæum, forms urinary depots. The fat and other humours which fill the cellules of the cellular membranes, sometimes form tumours, known by the generic term *wens*. As these last tumours may take place in any part of the body, we shall treat of them separately; at present we shall speak of those formed from other fluids, emanating from the blood, in treating of diseases in their anatomical order. Such is the classification we have thought proper to adopt; and this is our view of tumours in general. We now proceed to treat of each in particular, commencing with *erysipelas*.

ARTICLE I.

Of Erysipelas.

Erysipelas is an inflammation of the surface of the skin, of a greater or less extent, without exact bounds, accompanied with slight tumefaction, a sharp pungent heat, burning heat, and itching, and of a bright red colour, shining, and inclined somewhat to yellow; disappearing upon pressure, and returning after it is removed: and what afterwards characterises erysipelas, is that the inflammation seems to change place, and, in proportion as it leaves one part, it gradually extends to another contiguous to it.

Erysipelas may affect all parts of the body; but the face, the neck, and the extremities, are attacked more often than other parts.

Erysipelas is simple or complicated. Simple erysipelas is confined to the skin, and is accompanied with those symptoms which are enumerated in the definition, when it depends upon an external cause. But when it is produced by an external cause, it is almost always preceded or accompanied by lassitude, slight chills, loss of appetite, nausea, and a slight fever.

Erysipelas may be complicated with an inflammatory fever, or with a bilious putrid or malignant fever. It may

be complicated also with phlegmon or with edema. In the first case it is termed *phlegmonous erysipelas*; in the second, it is called *edematous erysipelas*.

In the phlegmonous erysipelas, which is usually attended with inflammatory fever, the inflammation extends through all the thickness of the skin and subcutaneous cellular tissue. But the tumour is not defined and circumscribed as in phlegmon, properly so called. The erysipelas is in general very serious; it often terminates in enormous abscesses, or, what is still worse, gangrene supervenes, destroys the skin and cellular tissue to a greater or less extent, and leaves large ulcers; the cure of which is always long and difficult, sometimes impossible.

In edematous erysipelas the edema or serous infiltration is the primitive principal disease, and erysipelatous inflammation is only a complication. Thus the term erysipelatous edema would suit better this compound affection, than that of edematous erysipelas. Moreover, this erysipelatous inflammation, which supervenes upon edema, is, in general, very serious, and almost always leads to gangrene. We shall speak of it more particular in treating of edema.

Simple or complicated erysipelas varies according to certain circumstances, with which it may be accompanied: hence it is distinguished into miliary, pustular, periodical, and irregular.

The miliary erysipelas is that in which the surface of the skin is covered with a great number of small pimples, filled with serum.

Pustular erysipelas is characterized by vesicles, or small pustulas, very near each other, which cover the erysipelatous redness, and which are sometimes white, sometimes red, inclining to black. As pustular erysipelas almost always attacks the body, and forms a broad band; it has been called *zone*: we shall speak of this particularly.

The fixed erysipelas is that which does not change its place, but remains fixed, or goes through all its different periods in the part where it began.

The irregular erysipelas moves with rapidity from one place to another: this erysipelas ought not to be confounded with that which spreads progressively, and gets well in one part in proportion as it extends in another; if this latter inflammation commence on the face, for example, afterwards, in proportion as it abates in this part, it may extend to the neck, breast, &c. and having gone through its different periods in those parts, it will terminate entirely. The irregular erysipelas, on the contrary, moves with a singular rapidity

from one part to another; as from the face to the arm, or the breast; from one limb to another, without going through its different periods, in the part which was primitively affected, or without ever leaving in the part any trace of its existence. The sudden displacement of erysipelas is called *metastasis*. Sometimes this metastasis interests internal organs essential to life. This case is always dangerous, often fatal,

The causes of erysipelas are external, or internal. The external causes are all agents, chemical and mechanical, capable of irritating the skin, raising its sensibility, or attracting the blood into the vascular net-work which enters into its composition. Thus, the heat of the sun and of fire, to which the body is exposed; the sting of certain insects; the application of all acrid, irritating substances; the use of oils, of ointments, and rancid plasters; hard and reiterated friction, may produce erysipelas, which is sometimes very extensive. We have seen extensive erysipelas arise on the skin of a person, in consequence of the application of hemlock plaster for a swelling of the spleen. This erysipelas, of the miliary kind, occupied not only the place where the plaster was applied, but extended also to a great extent on the neighbouring skin: it was cured, however, very easily, by the use of emollient fomentations.

But erysipelas from an external cause is rare. This kind of inflammation almost always depends upon an internal cause, that is to say, upon an irritating principle, which nature casts out, and throws upon the external part. This internal cause is little known; nevertheless, if we consider the advantages which vomits and mild purges procure in erysipelas—if we attend to the state of the tongue, which is almost always covered with an orange-yellow coat, more or less thick, we shall be led to believe that this cause has its seat ordinarily in the *primæ viæ*, and that it consists of a quantity of bile of bad quality.

Youth, puberty, pregnancy, cachetic diseases among old men, a fine delicate skin, gross aliments, putrid meats, remaining in a moist atmosphere filled with infectious miasmata, a wet season, cold after a long drought and great heat, high-seasoned food, the abuse of fermented liquors, spirituous potations, gluttony; certain acrid, crude aliments, such as onions, garlic, some shell-fish, fish of different kinds; violent and forced exercise, a bilious temperament, &c. are so many causes or circumstances which dispose to erysipelas. It has been observed, that persons born of parents subject to erysi-

pelas, have a predisposition to it, as well as those who have been previously affected.

The occasional, or exciting causes of erysipelas, are certain strong emotions of the mind, as anger, violent chagrin, sudden fright; sudden and severe cold when the body is heated: the omission of an accustomed bleeding; the suppression of the menses, the hemorrhoids, or any other habitual evacuations; the repercussion of insensible perspiration, &c.

The symptoms of erysipelas are a redness, more or less bright, partaking a little of the yellow, and sometimes of the livid, and disappearing upon pressure; a pungent pricking pain, accompanied with itching, and a feeling of erosion and of burning heat; a tumour, more or less extensive, without regular bounds, not much elevated above the neighbouring parts, and without remarkable tension. When erysipelas is intense, vesicles appear upon the parts most inflamed; they vary in size, and are filled with a yellowish fluid, more or less limpid.

When erysipelas depends on an external cause, the symptoms are confined to those which have just been detailed; the disease is not attended with any general disorder, unless the inflammation be very considerable, or seated in parts of great sensibility, the irritation of which is quickly communicated to the nervous system, and to the organs of circulation. But when, as is most common, it results from an internal cause, it is ushered in by constitutional symptoms; such as spontaneous lassitude, general uneasiness, nausea, transient chills, hardness and frequency of the pulse, &c. On the second or third day of this general disturbance of the animal economy, excited by the causes giving rise to the inflammation, the erysipelatous eruption takes place; the heat, redness, pain and tumefaction of the skin go on augmenting until the third or fourth day. These symptoms, as well as the febrile action, retain their violence nearly the same time; they then diminish. Towards the tenth or twelfth day, the epidermis peels off, or is formed into a slight crust, which loosens, and the disease is cured. Sometimes erysipelas terminates by a urinary deposit, by copious sweats, abundant alvine evacuations, or nasal hemorrhagy, but most commonly without any appearance of crisis.

Erysipelas may be complicated, as we have before observed, with inflammatory, bilious, or putrid fever: its peculiar symptoms are superadded to those with which it is complicated. Thus, when it is complicated with inflammatory fever, the pulse is hard, frequent, and full; the countenance is red,

and animated ; the thirst is urgent, and the heat is intense. The complication with bilious fever is characterized by frequency of pulse, nausea, bitter taste in the mouth yellow coat on the tongue, and violent but regular paroxysms. The complication of erysipelas with putrid fever, is marked by a relaxed state of the features of the face a sooty colour of the mouth and teeth, fetor of the breath, weakness of pulse and all the other symptoms of prostration of strength. We may say the same of all the other diseases with which erysipelas is complicated. It may easily be conceived, that these different complications must influence the desiccation, course, and termination of erysipelas, as well as the prognosis and treatment.

Erysipelas may terminate in delitescence, resolution, supuration, and gangrene. It is, however more prone than any other inflammatory tumour, to delitescence and metastasis. It seems that, in this kind of inflammation the cause of the disease acting on a large surface, adheres feebly to the points to which it is fixed, and therefore is more moveable and susceptible of being translated from one part to another. Delitescence is favourable, when erysipelas depends upon an external cause, as that which constitutes the first degree of a burn ; because, by rendering the disease abortive, it shortens its existence. It is unfavourable, however, when its cause is internal ; because it is ordinarily followed by metastasis. As erysipelas, then, originates from a morbid principle, which nature has thrown upon the part, delitescence cannot be favourable, for it always endangers its translation to an internal part. Resolution is the most desirable, and the most common termination of erysipelas. We may expect that it will take place, when the erysipelas is simple and confined to the skin ; we judge that it is going on, when the symptoms, after having existed for three or four days, begin to decline ; finally, we may be certain that it is effected, and that the disease is terminated, when the redness, heat, pain, and tumefaction are dissipated, and the cuticle falls off in scales, leaving only a slight elevation, which soon disappears.

Suppuration seldom takes place in phlegmonous erysipelas ; it is always unfavourable, and we ought to endeavour to prevent it by all possible means. Its danger varies according to the extent and violence of the erysipelas. When the disease occupies a whole limb, and the inflammation penetrates to some distance in the adipose substance, suppuration produces enormous abscesses, which bring away the skin, and denude the muscles to a great extent.

This event is in general very dangerous, and sometimes the patient sinks, worn down by the copious suppuration. When the inflammation does not penetrate to the same depth in every part, suppuration takes place in those only where the cellular tissue is most inflamed. In this case, which is not often serious, there are many small abscesses; we have seen so many as nineteen on the leg and thigh of a man affected with phlegmonous erysipelas.

Gangrene is always a dangerous termination of erysipelas: it affects the skin and subcutaneous cellular tissue, the destruction of which is followed by the denudation of the muscles, and large ulcers, the cure of which is always long and difficult; often impossible. This termination rarely results from excess of inflammation; it is ordinarily produced by the malignity of the cause of the disease, and usually occurs when erysipelas is complicated with putrid or malignant fever.

The prognosis in erysipelas is different, according to the cause of the disease, its seat, its violence, and its complications. Erysipelas from external causes, is less dangerous than from internal. Erysipelas of the face, and all parts of the head, is much more dangerous, *cæteris paribus*, than erysipelas of other parts of the body; because it may extend to the membranes of the brain, and prove fatal. Simple erysipelas, of a moderate extent, affecting the limbs, is not dangerous, and terminates by resolution, in the course of ten or twelve days. Phlegmonous erysipelas, especially if it be extensive or severe, is more dangerous; because it almost always terminates in suppuration, sometimes in gangrene. Irregular erysipelas, that is, erysipelas which moves from one part to another, is always more to be dreaded than that which is stationary; because it may be followed by a total metastasis. Finally, complicated erysipelas is more or less dangerous, according to the nature of the disease with which it is complicated. Before entering upon the treatment of erysipelas, we ought to examine with attention if it be produced by an internal or an external cause; for, in the two cases, our conduct must be different, since what would be useful in one might be injurious in the other.

When erysipelas depends upon an external cause, and it is not considerable, it is sufficient to remove this cause if possible, and to employ topical repellents to produce a delitescence of the inflammation. But if the inflammation be so considerable as to render this result hopeless, we ought then to have recourse to emollients, and afterwards to resolvers. If the disease be very extensive, if it be accom-

panied with fever, and the patient be young and plethoric, we may bleed once or twice, and give diluting, cooling drinks ; but bleeding is very rarely necessary.

When erysipelas depends upon an internal cause, the treatment should vary according to the intensity of the disease, and the circumstances which accompany it. When it is simple, inconsiderable, and the patient experiences none of those symptoms which announce a disorder of the primæ viæ, the efforts of nature, seconded by a suitable regimen, and the use of diluting, cooling, and acidulated drinks, usually effect a cure. But commonly erysipelas, from an internal cause, is preceded or accompanied by considerable febrile action, disorder of the primæ viæ, and symptoms which announce the existence of bilious fever, or some other complication. Now these different circumstances furnish different curative indications, which we proceed to lay down. When erysipelas is very intense, and extends to the cellular tissue, bleeding is necessary to diminish the vital powers, and to direct the efforts of nature towards a resolution of the inflammation. The number of bleedings should be proportioned to the violence of the disease, the age of the patient, his temperament, and the state of his strength before the appearance of the erysipelas. Bleeding is usually necessary, when erysipelas depends upon the suppression of an habitual sanguinous evacuation. In this case, we ought to endeavour to recall the suppressed evacuation, by the application of leeches in the neighbourhood of the part whence such evacuation took place, and by all other known means not contra-indicated by the state of the disease.

In the kind of erysipelas in which bleeding is deemed indispensable, we ought to subject the patient to the most severe regimen, and insist on the use of diluting, cooling drinks, mixed with a portion of nitre and acids.

In other kinds of erysipelas bleeding is rarely necessary, and it might be injurious, by diminishing those powers which nature requires to expel the cause of the inflammation and procure its resolution ; hence cautious practitioners employ venesection with great reserve. Bleeding would be particularly injurious in erysipelas complicated with putrid or malignant fever, or one which has a marked tendency to gangrene, as well as in irregular erysipelas. In the first case, it would not fail to aggravate the disease, and to favour gangrene, by diminishing the vital forces already weakened ; in the second, it might give rise to a fatal internal metastasis.

Emetics are almost always indicated in erysipelas from

an internal cause, by the complication of the disease with a bilious or putrid fever. It is in the first days of erysipelas, when the tongue is moist, and after having employed a bleeding, if judged necessary, that emetics ought to be administered. Heat and dryness of the skin, dryness of the mouth and tongue, agitation and inquietude, contra-indicate the use of this remedy. If these symptoms be present, we should always confine ourselves to the use of cooling, diluting drinks, and emollient injections.

In that kind of erysipelas which some authors have called *bilious*, because it is always attended with symptoms which denote a disorder of the *primæ viæ*, it often happens, that, after the action of emetics, the tongue continues to be covered with a yellow crust, which indicates the use of mild purges; such as the emetic tartar in a large quantity of water, tamarinds and whey, &c. which ordinarily procure a prompt solution of the disease.

When erysipelas is accompanied with symptoms which threaten gangrene, such as a livid colour, a doughy softness and want of sensibility in the part, with prostration of strength, slight delirium, sooty coat on the teeth and tongue, we must have recourse to the most prompt measures to raise the vital powers. Thus generous wine, camphorated mixtures, or pills, and, above all, bark in substance, or in strong decoction, acidulated with sulphuric acid, may be given with advantage.

When erysipelas depends upon any internal disease, known by a particular name, such as rheumatism, gout, scrophula, &c. after having cured the inflammation by the ordinary means, we should endeavour to destroy the virus which has produced it; for, while this exists, the patient remains exposed to periodical erysipelas, which is usually accompanied with febrile action, and all the symptoms which announce a deranged state of the *primæ viæ*.

The virus once destroyed, erysipelas ceases to return. When periodical erysipelas arises from an internal unknown cause, we should expect to destroy it less by pharmaceutical remedies, than by the proper and reasonable employment of the means which are derived from *hygieia*.

When erysipelas is complicated with a primitive or essential disease, such as putrid fever, or with any other serious affection, we should adopt a treatment suited to the complication and the actual state of the patient; and, in every case, we are to direct our curative means against that disease which threatens most the patient's life: it is proper even, at times, entirely to neglect the erysipelas, while we occupy

ourselves solely with the more dangerous complaint with which it is complicated.

In the external treatment of erysipelas from an internal cause, we should carefully avoid topical repellents; we should also abstain from them when the case is doubtful, lest we produce a dangerous metastasis. On the contrary, we employ with advantage emollient fomentations, such as are relaxing and slightly discutient; a decoction of linseed, or marshmallow root, with the flowers of elder, is the best application we can make use of. But as the linens which imbibe these become dry so much the sooner as there is great heat in the part, we should renew them often, taking care not to expose the part to a current of cold air.

When erysipelas is phlegmonous, poultices of flax-seed and marshmallow water may be usefully substituted for fomentations; they are even preferable, since the inflammation extends deep, and partakes more of phlegmon than erysipelas. These applications are suited to all cases of inflammation from an internal cause, at the commencement of the disease; afterwards they require to be changed, according as the inflammation terminates in delitescence, resolution, suppuration, or gangrene.

When erysipelas suddenly disappears, metastasis, or the translation of the morbid matter to an internal organ, is to be feared; it is certain that such translation has taken place, when the patient experiences symptoms which indicate inflammation of an organ previously healthy. This displacement of erysipelas is always dangerous, but especially if the organ to which the inflammation is translated be essential to life. In such cases, we ought to endeavour to recall the erysipelas to the external part, by applying a large blister upon the part first affected, or to a part near the organ affected. Erysipelas does not always follow the application of the blister, but the suppuration is salutary, provided it be abundant; it is, moreover, necessary to employ such means as are proper to diminish the inflammation of the organ to which it has been translated.

When erysipelas terminates by resolution, which we know by the diminution of all the symptoms, we substitute for the fomentation of which we have spoken, a decoction of the flowers of elder, with a little spirits of wine.

In phlegmonous erysipelas, if the inflammation, instead of diminishing towards the seventh or eighth day, continue to the same degree, suppuration is to be apprehended. In this case, we should persist in the use of topical emollients; and as soon as we perceive fluctuation, or even merely a

purulent softness, the necessary openings are to be made to give issue to the pus ; for if we defer opening these collections of matter, it tears the cellules of the cellular tissue, and collects in a large abscess, the sides of which re-unite with great difficulty. The extent of the incisions is not to be proportioned to the size of the abscess, but several must be made in the most depending parts.

When the violence of the inflammation leads to the fear of gangrene, we continue the use of emollient fomentations, or poultices, in order to diminish the swelling, and thus prevent mortification, or to arrest its progress, if it have already commenced. But if gangrene arise from a want of vital power, we are to apply to the part compresses wet with the decoction of bark, and camphorated spirits ; and continue them until nature shall have made the line of demarkation between the living and dead parts. When the gangrene is bounded, we shall facilitate the separation of the sloughs, by putting upon their edges simple digestive cerate ; and when they are separated, the ulcers should be dressed with dry lint. In this case, as well as in that in which erysipelas terminates in suppuration, as the patient is wasted by the abundant discharge, it is proper to keep up his strength by very nourishing and easily digested aliment, and by the moderate use of wine and vinous tincture of bark internally.

Regimen is an essential part of the treatment of erysipelas : we refer the reader to what has been said on this subject, under the head of *Inflammation in general*.

Hitherto we have spoken of erysipelas generally, describing its symptoms, exposing its most common complications, and laying down the treatment. In order to complete what we have to say in relation to this disease, we think proper to add to what has already been said, a description of erysipelas of the face, and of that which is known by the name of *pustular erysipelas*.

SECTION I. *Of Erysipelas of the Face.*

Erysipelas of the face is rarely produced by an external agent ; an internal cause almost always gives birth to it. It comes on sometimes after wounds of the head, or after operations performed upon this part ; but, in such cases, the wound, or the operation which it follows, is only to be regarded as the occasional or determining cause of erysipelas, which would probably have shown itself elsewhere, had the same irritation there existed.

An attack of erysipelas of the face commences suddenly with a severe chill, followed quickly by great heat, and commonly by headach, stupor, and a frequent pulse, unusually full and hard. At the end of two or three days, the patient feels pain in some part of the face, generally at the eyelids; a lively red, sometimes partaking of the yellow, appears there; the part soon becomes swollen, tense, and shining; the redness at first is of no great size, but it gradually extends from the part where it commenced to the whole face, frequently to the hairy scalp, and down the neck. As the redness extends, it usually disappears, or, at any rate, diminishes in the part where it began; all the parts which become red, are, at the same time, affected with a swelling, which subsists sometimes after the redness has disappeared; the whole countenance is tumefied, and the eyelids are sometimes so swollen that the patient cannot open them; at the same time the other local symptoms are more or less intense. All these symptoms go on increasing for some time, and often pustules, or vesicles, of greater or less size, filled with a thin liquid, either yellowish or colourless, appear; the surface of the skin, in the part where these pustules break out, sometimes becomes livid, and blackish, but very rarely does this lividity extend beyond the surface, and it marks the gangrene of the skin; the patient often feels troublesome itching in the part affected: finally, at the end of some days, there appears a secretion of yellowish serous matter, which readily hardens, and forms crusts. This secretion is more abundant in some parts of the face than others. These symptoms soon diminish, the redness becomes less intense, the skin wrinkles, the epidermis falls off in scales, and in a little time the patient recovers.

Inflammation of the countenance does not produce any remission of the fever which preceded it; sometimes even the fever becomes more violent, in proportion as the inflammation increases and extends. This inflammation continues generally eight or ten days, and the symptoms which accompany it always increase or diminish, according as the inflammation itself progresses or abates.

If, in proportion as the inflammation progresses, the delirium and comatose affections increase, death is to be apprehended. The patient then dies of apoplexy, on the seventh, ninth, or eleventh day; but more commonly he falls a victim to inflammation of the membranes of the brain.

When erysipelas of the face, after having made some progress, remains stationary, and there is delirium and stu-

por, and the pulse is small, or, without being small, is too frequent, the skin moderately warm, and there are no symptoms of disorder of the *primæ viæ*; and finally, if typhus fever be then prevalent, the case is dangerous. We should mistrust the result, when nature seems in doubt, and when her incoherent efforts, without order or relation, seem to tend to no good end; for these symptoms indicate very serious disorder in the animal economy. The dissection of persons who have thus died, has often discovered no traces of disease.

Erysipelas of the face commonly terminates by resolution; sometimes abscesses form in the eyelashes; finally, gangrene may affect some parts, and extend to others.

The treatment of erysipelas of the face being included in what has been said of erysipelas in general, we shall only remark, 1st. That, in cases of very intense disease, attended with symptoms indicating an affection of the brain, bleeding and blisters may be of eminent service. 2d. That topical applications are useless, and may be injurious, by the cooling or drying on the compresses, which then excite pain, by adhering to the parts. 3d. That the abscesses which occasionally form in the upper eyelid, may be left to nature when small, otherwise they must be opened by a transverse incision.

SECTION II. *Of Pustular Erysipelas, or Shingles.*

Pustular erysipelas is an inflammation of the skin, which appears to affect more particularly its reticular structure, and which is always accompanied by a greater or less eruption of pustules. This kind of erysipelas is characterized by a semicircular red band continued round the body, or formed by a succession of circles; by pustules, which cover the redness, and sometimes precede it; by stinging pain, which precedes and accompanies the erysipelatous eruption; and finally, by the drying of the pustules, and their transformation into crusts, which fall off, and terminate the disease, the duration of which is from twenty to thirty days.

Pustular erysipelas partakes of the ring-worm, in its redness, the nature of its pains, the small pustules which cover the inflamed part, and the crusts which follow; but it differs from it, 1st. By the nature of its cause; 2d. By the preceding symptoms; 3d. By the form it assumes; 4th. By its duration; and, lastly, By its termination, which is always complete and certain when the crusts have separated.

The shingles may appear in any part of the body, but it

most commonly takes place on one of the sides of the chest or abdomen, where it forms a half girdle, three or four inches broad, and extended, more or less obliquely, from the sternum, or umbilicus, to the vertebral column ; sometimes it passes beyond the centre of the back, but it very rarely extends round the whole body. The girdle which it forms, may be either regular and continuous, or interrupted by portions of sound skin. Pustular erysipelas may be either simple or complicated, sporadic or epidemic ; it may arise from an accidental cause, or from a cause which returns at longer or shorter intervals ; it may also be connected with certain evacuations, or other diseases : it has been known to alternate with the gout, rheumatism, diarrhœa, or attend the monthly evacuations, &c.

Pustular erysipelas is a disease of all climates ; it may appear in any season, but is most frequently met with in spring and autumn ; it is more common in cities than in the country, and very rarely attacks children.

This disease depends always upon an internal cause, the nature of which is unknown ; but the circumstances which concur to give rise to erysipelas generally, may also produce the shingles. Persons of a bilious temperament, who use too freely high-seasoned food and spirituous drinks, are much more subject to it than others. It is generally attended with *saburra* in the *primæ viæ*.

The course of the disease may be divided into four periods : 1st. That of its attack ; 2d. That of the eruption ; 3d. That of the exsiccation of the vesicles, and the formation of crusts ; 4th. The falling off of the crusts.

1st period.—Febrile action, general uneasiness, shooting and pricking pains in different parts of the skin ; agitation, especially during the night ; obstinate watchfulness, anxiety about the precordia, anorexia, disgust, nausea, and even vomiting ; sometimes greater or less difficulty of respiration : such are the symptoms which usually precede the eruption of pustular erysipelas. They increase for several days ; the patient then complains of an acrid, burning, and stinging heat in the part where the eruption is about to appear ; this part becomes somewhat red, slightly swollen, and the patient experiences in it a severe smarting, especially during the night.

2d period.—Vesicles, or small pustules, appear very near each other ; sometimes they are white, at other times more or less red ; they cover the erysipelatous redness, and are entirely developed in a short time ; they rise in succession ; some of them dry and disappear, while others are forming ;

they are at first very small, but they gradually augment, and form true phlyctenæ; the serum they contain becomes turbid, whitish, and sometimes of a reddish brown colour; they open of themselves, or are torn off by the scratching of the patient; at the same time the other symptoms diminish. Sometimes the pustules appear before any redness takes place. In this case, the base of each vesicle is encircled by an areola of inflammation, the red colour of which progressively extends, and increases with the augmentation of the pustules; the areolæ soon unite, and form an erysipelatous redness over the whole surface of the diseased part.

3d period.—As soon as the pustules are opened, the serum oozes out, and moistens the excoriated parts; the pungent stinging pain continues, especially during the night, but it is less than during the first and second periods; sometimes the reticular tissue becomes ulcerated, and small unequal granulations appear, separated from each other by fissures; the fluid which moistens the excoriated parts, produces, by drying, dark grey crusts, of an irregular form, and from one line to four or five lines thick; the swelling now diminishes, and quickly disappears.

4th period.—Although the crusts become dry and black, and fall off successively, the redness of the skin diminish, the stinging and itching abate, and the epidermis be regenerated under the crusts, no desquamation takes place in parts where there are no vesicles; the skin continues a little red in those places where the pustules were situated, and sometimes small pits remain, like those which follow small-pox.

When the disease has terminated its course, it sometimes happens that the patient experiences stinging and severe pain in the part affected, which is only removed by the application of blisters: it occurs especially after changes of the weather, and sometimes continues many years.

The prognosis of shingles varies according to the extent and intensity of the disease, the constitution of the patient, and the complications which may attend it. In general, when the eruption is not very extensive, and forms only half a zone, and the pustules are distinct, the disease is not dangerous; some patients, indeed, are not prevented from attending to their ordinary business. When, however, the band is broad, and encircles the whole body, the case is much more serious, and, according to the opinion of Pliny, inevitably fatal; death, however, very rarely takes place, but very great danger may result from a metastasis of the disease to the chest or abdomen. This accident is

especially to be feared in persons disposed to phthisis, and Lorrey justly observes, that pulmonary consumption may be thus brought on.

As to the treatment of shingles, when it is not complicated with any other disease, it is sufficient to put the patient upon a proper regimen, and to prescribe diluting drinks, such as whey, veal broth, oxymel, &c. and to keep the bowels open by injections. When the scabs have separated, it is proper to purge the patient. A vomit is almost always necessary in the commencement, indeed it is indicated in any period of the disease, when there is evidence of derangement of the *primæ viæ*.

Bleeding has sometimes been used with success, when the fever and agitation were very great; but we should use this remedy with caution, lest we produce a retrocession of the disease.

The regimen requires great attention. While nausea and anorexia exist, the patient should take only three or four cups of broth in twenty-four hours. As these symptoms diminish, the nourishment may be increased; but the food should always be light, easy of digestion, and adapted to the state of the patient. If he be weak, he may take wine and water.

All topical applications are useless, or injurious; the part should merely be covered with fine linen, which is frequently changed, so as to absorb the discharge. Liquids, and fatty substances, are injurious; astringents are highly dangerous.

When the disease is terminated, if pain continue to be felt in the diseased part, we should have recourse to warm baths, to the application of asses milk, or to a mixture of oat-water with cow's milk; and, if they resist these remedies, one or more blisters should be applied.

ARTICLE II.

Of Phlegmon.

Phlegmon is a circumscribed, elevated, inflammatory tumour, accompanied with heat, redness, pain, and sense of pulsation; it is seated in the cellular tissue. When it attacks the subcutaneous cellular tissue, the skin participates in the inflammation from the beginning of the disease; but when it is situated deeply, the skin does not become inflamed until the disease approaches the surface of the body.

Phlegmon may take place in any part where cellular tissue exists; but some parts, although entirely formed of cellular tissue, are hardly susceptible of this disease, either by reason of their thinness or their dense structure; such are membranes, aponeuroses, ligaments, tendons, cartilages, and bones: but all other parts may be affected with phlegmon, and generally every part is liable to it in proportion to the quantity of cellular tissue it contains.

Phlegmon may be either external or internal: the former alone belongs to the province of surgery.

Phlegmon most frequently appears on the neck, in the arm-pits, the mammæ in women, the upper and lower extremities, and the margin of the anus.

Phlegmon sometimes presents certain modifications, which have received the names of erysipelatous, edematous phlegmon, &c. but these modifications do not change the character of the disease, and the scholastic distinctions to which they have given rise are not worthy of attention.

Phlegmon is always produced by an irritating cause, which augments the vital action of the vessels and nerves of the irritated part, produces an afflux of blood and lymph towards it, and, by the accumulation of these fluids, causes swelling, distension, pain, &c. Phlegmon is often occasioned by strong compression of the vessels and nerves, by a wound, a prick, a burn, the presence of a foreign body, &c. Sometimes it appears spontaneously, or from an internal cause, the nature and *modus operandi* of which are entirely unknown.

The symptoms of phlegmon are a hard, circumscribed, elastic tumour, shooting pulsating pain, redness, (more or less bright, according to the depth of the tumour, always greatest in the centre, and not disappearing upon pressure like that of erysipelas), heat more or less intense, according to the extent of the affection of the skin. These symptoms successively augment, and when the disease has reached its crisis, if it terminate by resolution, they gradually diminish, and finally disappear; but when any other termination takes place, these symptoms undergo modifications, of which we shall speak hereafter.

When phlegmon depends upon an external cause, when it is of no great size, and is not situated in any sensible part, it produces scarcely any fever; if otherwise, fever appears, with heat of the skin, thirst, dryness of the mouth, redness of the face, agitation, watchfulness, &c. The violence of these symptoms is proportioned to that of the inflammation, and the degree of sensibility of the part affected. In phleg-

mon from external causes. fever always follows the inflammation; in that from internal cause, it commonly precedes it: thus, in the first place, fever has been regarded as the effect of the local disease; and, in the second, as an effort of nature to rid itself of a morbid principle by inflammation of an external part.

Phlegmon may terminate by delitescence, by resolution, by suppuration, by gangrene, or by induration.

Delitescence rarely takes place in phlegmon, but it may occur in phlegmon from an internal cause. It is to be feared if the symptoms of inflammation diminish before it has attained its height; we should then endeavour to prevent it by irritating applications, and in some cases, by a blister to the part.

Resolution is the most favourable termination of inflammation, even when it depends on an internal cause; for by the mechanism of inflammation, nature modifies and elaborates the cause of the disease, destroys its injurious qualities, and discharges it by the excretions. We should never fear producing this termination; we ought especially to endeavour to bring it about when the inflammation is deep seated, and the abscess which would result from it would be difficult to heal, or when suppuration would injure the organ which it affects. We may expect resolution when inflammation is not very intense, and when it attacks parts, the cellular tissue of which contains little fat. This termination commences by the successive diminution of the local symptoms; such as heat, redness, pain and tension; and if the tumour be situated under the skin, the epidermis scales off.

Suppuration is almost inevitable in phlegmon which is situated in a part that contains a great quantity of fatty cellular tissue; such as the buttocks, the parts about the anus, &c. The time in which suppuration is produced, varies from the fifth to the eighth day, when the inflammation is intense, and situated in a part, the cellular tissue of which contains much fat; in other cases, suppuration does not commence until the fifteenth or twentieth day, according to circumstances.

We may anticipate suppuration when the inflammation is violent and rapid in its progress, when the pain is throbbing, and when the part affected is fatty; we know that suppuration is taking place by the augmentation of all the symptoms, and by irregular chills; lastly, we know that pus is formed when the tension, heat, and fever are diminished, when the pain becomes gravitated, when the tumour projects in the centre, and fluctuation is perceived. If the tumour be not

opened by art, the skin at its apex becomes white and thin, it breaks and pus flows out.

Phlegmon sometimes terminates by gangrene. This may arise from the malignity of the inflammation; but whatever be its cause, it commences by a diminution of the heat, pain, and tension, by a change of the colour of the part to livid and black, by phlyctænæ, filled with black serum, and by other symptoms, of which we have spoken in treating of gangrene. When phlegmon affects the whole thickness of a limb, as in comminutive fractures, gun-shot wounds, deep punctures, &c. the violence of the congestion and the strangulation produced by the resistance of the muscles may produce sphacelus of the limb; but when phlegmon is circumscribed, and affects only the subcutaneous cellular tissue, the gangrene is confined generally to the apex of the tumour. Thus we see in extensive inflammations about the anus, a tumour forms, the summit of which is converted into a large eschar, that contains not only the skin, but the adipose cellular substance, so that when the eschar separates, the glutæus muscle is denuded to a great extent.

Phlegmon may terminate by induration; but this seldom happens except in glandular organs. The use of repellants, and even of resolvents, before the proper period, the chronic nature of the disease, the indolence of the affected part, are the causes which tend to produce it.

The prognosis of phlegmon depends not only on the extent and violence of the congestion, but also on the depth at which it is situated, the nature of the part inflamed, and its relation to other parts, especially those which are near it. If it be situated near certain tendons, and we cannot prevent suppuration or gangrene, they become denuded and exfoliate, and the parts to which they belong lose the power of motion. If it take place near the lower extremity of the rectum, the denudation of this intestine, even though it be not pierced, may cause a fistula.

Bleeding is more necessary to prevent and diminish the violence of inflammation in phlegmon, than in any other inflammatory tumour. By diminishing the quantity of blood, and, with it, the vital powers, we prevent the violence of the congestion, while we slacken the pace of the inflammation, and keep it in the degree favourable to resolution. In a robust patient, two or three copious bleedings in the commencement of the disease, are sufficient. Local bleedings also produce good effects, by emptying the vessels of the part inflamed.

We should second the effects of bleeding by cooling and

diluting drinks, by low diet, and injections, so as to keep the bowels open. Emetics are indicated when there is a disorder of the first passages; but they should not be given until after venesection, provided it be judged necessary. Purgatives are only proper towards the close of the disease, and when the state of the *primæ viæ* requires them.

Repellents may be employed in the commencement of a small phlegmon, which has arisen from an external cause; in all other cases they are improper, because they tend to produce metastasis, or induration. This last effect is especially to be feared after the disease has existed for several days, and the affected organ is of a glandular nature.

When repellents are not proper, or having been employed, have failed of producing the desired effect, we should apply emollients and anodynes; narcotics may be added if the pain be very severe: those which answer best are poultices of rye meal, boiled in a strong decoction of marshmallow root, or those of bread and milk, with the yolk of eggs and saffron. These applications should be continued until resolution is effected: it is advantageous to unite with them mild resolvents as the inflammation diminishes.

When phlegmon passes to a suppurative state, if the inflammation be severe, we should continue the emollient applications.

Active applications may produce gangrene, but when the inflammation is less severe, we may employ mild maturatives, of which the strength should be increased as suppuration progresses; those of the most active kind are required when the inflammation is languid and deep seated. If the purulent tumour be small, if it point rapidly, we may leave the opening of it to nature; in other cases we should puncture it, and treat it like any other abscess.

ARTICLE III.

Of the Furunculus, or Bile.

Bile is an inflammatory tumour which always terminates by suppuration, and in the centre of which is a kind of white eschar, called the core; it is seated in the cellular tissue, and extends to the skin; it inflames and opens in one place, sometimes in several; any part of the body furnished with cellular tissue may be the seat of it; however, it rarely attacks the forehead, the scalp, the sole of the foot, or the

palm of the hand ; perhaps it has never been seen on the eye-brows or the ears.

Furunculus is sometimes unique, and at other times several appear together in different parts of the body, especially in children, immediately after the termination of an acute disease. Sometimes the number of biles is so great that the patient cannot sit, stand, or lie down ; very often new ones are formed when the former cicatrize, and this for a considerable time.

A bile rarely exceeds the size of a pigeon's egg ; but when there is one only, it is often larger, sometimes as big as a hen's egg.

Biles always arise from an unknown internal cause ; sometimes they appear in persons in perfect health, and who have not been previously ill ; sometimes they follow small-pox, measles, putrid fever ; they are the means of discharging a morbid principle. When they appear, therefore, after an acute disorder, they are considered critical and salutary. The disease appears more frequently in the spring, and in persons of sanguine and plethoric habits ; infancy, youth, and old age are alike subject to it.

A bile appears in the form of a hard, circumscribed, painful, warm tumour, of a red colour, approaching to purple, in the form of a cone, the base of which is far below the surface of the skin, and its apex very little above it. The pain which it produces is more or less severe, according to its situation and depth. Those on the abdomen are extremely painful ; those which are situated deeply, and affect a small portion of the skin, are less so. On the hand, when the skin is most involved in the disease, the pain is very acute, because the skin is strongly stretched, especially near the apex of the tumour. Bile is rarely accompanied with any general disturbance of the animal economy ; but when it is very large, and approaches to the nature of anthrax, the excessive pain which accompanies it, causes agitation, watchfulness and fever. Large biles are often attended with painful swellings of the lymphatic glands that receive the absorbents extending from the tumour ; this swelling is dissipated when the tumour suppurates.

Biles always terminate in suppuration, but this suppuration is slow, and is confined to the summit of the tumour, which degenerates into a whitish pustule, sometimes livid, very sensible to the touch, and which, when opened, gives vent to pus, almost always bloody ; thick, grumous, white matter, which is the core, is next discharged. This matter, which at first might be taken for thickened pus, is in reality

cellular tissue, converted into a kind of eschar. When the bile is small and elevated, and one opening is only formed at the apex, the whole core escapes at once; but it divides into several parts when there is more than one opening, and the part remains hard for some time after the disease has terminated.

Suppuration being the necessary and inevitable termination of biles, we should endeavour to hasten the formation of pus by applying basilicon to the centre of the tumour, and covering it with a litharge plaster; the diachylon cum gummis, which is often used, is too active, and increases the pain. When the bile is very large and distressing, we may have recourse to emollient and anodyne poultices. A bile should be left to open of itself; when it does so, slight compression may be used, so as to discharge its contents.

If we open a bile, the operation is painful and useless, since the core cannot be discharged until it is separated from the neighbouring parts, and then the small orifices unite into a common opening, large enough to give it passage; but if these openings be distant from one another, it may then be proper to unite them, as well to discharge the core, as to facilitate the cure, which would be retarded by the thin edges of the skin; the parts being then less inflamed, the operation is less painful than in the former case.

Under the use of litharge plaster, a bile whose core has been discharged, soon heals; if the bile be large, however, simple ointment and poultice over it, are preferable; in the latter case, cicatrice remains for life.

If the opening of a bile close before the core is wholly discharged, another tumour forms; it is proper, therefore, to prevent the opening from closing by a dossil of lint, until the core entirely comes away.

As biles are always produced by an internal cause, it is proper to cleanse the blood, and to order frequent purges; this is particularly necessary when biles frequently return. Sometimes we are obliged to have recourse to a seton or issue in the arm, in order to prevent the frequent returns of the disease. If they arise from a scorbutic or syphilitic source, we must employ the specific remedies.

ARTICLE IV.

Of Anthrax, or Carbuncle.

Anthrax, or carbuncle, is an inflammatory and gangrenous tumour, seated in the subcutaneous cellular tissue, and in the ligaments. There are two kinds, mild and malignant.

SECTION I. *Of mild Anthrax.*

This first species bears a great resemblance to furunculus; it differs from it, however, by its magnitude, the intensity of its inflammation, and the extent of the gangrene, which affects not only the cellular tissue, but the skin on the apex of the tumour. It appears in persons in perfect health. It serves as a crisis to another disease, and depends always on an internal cause.

It appears most commonly on the neck, back, and limbs.

It commences in the form of a circumscribed, hard, bright red tumour, accompanied with acute burning pain, which patients compare to that of a live coal applied to the skin. On the summit of the tumour one or more pustules are soon formed, under which is a black crust, or eschar, surrounded by a shining inflamed circle, of a reddish brown, violet, or black colour. The redness, pain, and tension, extend often very far to the neighbouring parts. The eschar enlarges, softens, and opens, after two or three days, by small cracks, from which is discharged bloody, ichorous pus.

The mortification is sometimes confined to the cellular tissue, and does not extend to the skin, which then becomes soft and thin, and several small openings are formed at the top of the tumour, which unite after a little time. The cellular tissue, which forms the nucleus of the tumour, mortified and converted into a white eschar, separated by suppuration, escapes and discovers an ulcer, at the bottom of which we see muscles, tendons, and sometimes large vessels. The edges of this ulcer are irregular, and formed by a portion of thin skin, of a reddish brown colour: it is difficult of cure; it heals partly by the adhesion of the skin, and partly by the formation of a cicatrix. Mild anthrax does not always derange the health, but commonly it is preceded and attended with fever, which abates when the tumour opens and the eschar separates. It is generally attended with disorder of the first passages, sometimes of a bilious kind, more rarely putrid or malignant. When anthrax ap-

pears in the course of these last fevers, it is to be considered as critical. Mild anthrax is not a dangerous disease, unless it expose a joint, large nerve, or tendon.

Bleeding is improper in this disease; it would prostrate the vital powers, and perhaps occasion a metastasis. When the pulse is full and strong, and the countenance animated—when there is watchfulness and inquietude, cooling and acidulous drinks are alone necessary; but if there be prostration of strength, tonics and cordials are necessary. If the stomach and bowels be disordered, an emetic will be useful. The bowels must be kept open, and the diet adapted to circumstances.

As to local applications, if the inflammation be considerable, emollient poultices are indicated: irritating applications, usually called *maturatives*, are proper when it is feeble and languid. When the centre of the tumour is softened, and we perceive in it a pulpy feel, it should be opened with a cutting instrument, in order to discharge the mortified cellular substance, and the sanious pus, which would otherwise burrow into sinuses. When the mortification has extended to the teguments, and is bounded, the separation of the eschar should be promoted by unctuous and emollient cataplasms,—the simple ulcer which results is to be treated in the ordinary manner.

SECTION II. *Of malignant Anthrax, or Carbuncle.*

This may be distinguished into that which is pestilential, and that which is not so. The last is almost always sporadic; however, it appears epidemically in certain countries, and particularly in hospitals, where a great number of children are collected together. It attacks, indifferently, all parts of the body, except the palm of the hand, the sole of the foot, and the hairy scalp; but it is most common on the neck, face, and trunk. Infants are more subject to it than adults and old persons. It is most common in summer.

The malignant anthrax, which is not pestilential, commences with great heat and acute pain in the part affected: a tubercle, with very extensive base, is formed: it is circumscribed, very deep and hard: it is of a bright red in the centre, lighter in the circumference. The apex supports a livid vesicle, containing brown ichorous matter, and is converted quickly to a black eschar; sometimes dry and crusty, like that produced by a hot iron; sometimes soft and shining, like that resulting from the action of caustic potash. This eschar, which gradually increases, is surrounded by a doughy,

shining, emphysematous tumefaction, the paleness of which marks a languid inflammation, that extends to the neighbouring parts as the eschar increases. If nature have power enough to throw all the cause of the disease upon the affected part, and the gangrene be defined, the inflammation becomes stronger, assumes a phlegmonous character, and produces laudable pus, which separates the dead from the living parts.

Malignant anthrax, not connected with plague, is always accompanied with a general disturbance of the animal economy, evinced by nausea, vomiting, smallness and contraction of the pulse, prostration of strength, syncope, anxiety, sinking of the countenance, pain in the head, watchfulness, delirium, and all the symptoms which characterize putrid or malignant fever, sometimes both.

The progress of the disease is generally very rapid; sometimes it proves fatal in thirty or forty hours; at other times, not until the ninth or eleventh day. The danger is proportioned to the extent of the disease; and it is to be remarked, that the gangrene is more extensive below than on the surface of the skin. Large nerves, blood-vessels, and other important organs, are included in the eschar, the separation of which may be followed by hemorrhage, or other dangerous accidents. If the cheeks be affected, they sustain an irreparable loss of substance.

This disease is always dangerous; when it affects the face, neck, chest, abdomen, groin, or axilla, it is more so than when it is seated on the extremities; the danger is also proportioned to the extent of the disease, and a livid and black colour of the carbuncle is a dangerous symptom. When the inflammation disappears suddenly, the disease commonly proves fatal; when the carbuncle is elevated, and a mild and permanent sweat appears over the whole body, with diminution of the nausea, anxiety, &c. the prognosis is favourable. Feeble, cachectic persons, or those worn down with fatigue, children, and old men, recover less frequently than healthy adults. When carbuncle appears in the advanced stage of putrid or malignant fever, and is accompanied with a diminution of other symptoms, it is critical; it is not so in fevers caused by the carbuncle itself; in such cases, the efforts of nature rarely expel the deleterious principle. The internal treatment of carbuncle is the same as that of putrid and malignant fevers. The stomach and bowels being generally disordered in the commencement, or course of the disease, an emetic is indicated; after this we should prescribe wine, camphor, ammonia, and especially bark. If there be

somnolency, we should apply blisters to the legs : bleeding would be fatal. The apparently inflammatory symptoms, in the commencement of the disease, are highly deceitful.

The local treatment consists in the immediate application of a hot iron, caustic potash, or muriate of antimony. This practice, recommended by Celsus, and followed by almost all practitioners, as well ancient as modern, limits the progress of the gangrene, and rouses the languid action of the part.

After the application of caustic to the centre of the tumour, an emollient anodyne poultice is to be applied, to diminish the tension, heat, and extreme pain. The most irritating applications, recommended by many practitioners, are ineffectual, and often aggravate the disease ; they are only proper when the anthrax is developed very slowly, and the inflammation languid ; but, even in this case, the hot iron is a far better remedy.

If, before we are called, the disease has made great progress, and neither the hot iron nor caustics can reach the living parts, on account of the thickness of the eschar ; or, if the disease be too extensive to render these remedies admissible, we should then be content to scarify the gangrenous parts, so as to discharge the putrid ichor, and to rouse the weakened action of the subjacent parts. The scarifications should not extend beyond the eschar ; they might produce dangerous, or fatal hemorrhages, on account of the extreme debility of the vessels near the part.

When the mortification is defined, we may use unctuous, emollient, and anodyne applications. If the eschar be thick, it should be cut in two ; but it ought never to be drawn away with force. The ulcer which succeeds, should be dressed with an antiseptic application until it become healthy, when it is to be treated like any other simple sore.

The pestilential malignant carbuncle is a symptom of the most intense degree of typhus, called *plague* and *pestilential fever*. It is remarked that this symptom rarely appears, except at the height of the pestilential epidemic, at which time the disease is most severe, and most highly contagious. Several carbuncles may appear in the same subject ; they take place in every part of the body, except those covered with hair ; but fleshy parts are most frequently affected. The disease rarely appears in the seat of ordinary buboes.

Pestilential anthrax commences with a painful itching in the part. At first a small vesicle appears, no larger than a pin's head, and becomes filled with yellow serum, without any sign of inflammation : pimple after pimple rises, and extends.

When they have attained the size of the thumb-nail, the pellicle cracks, and discharges a little serum, exposing the black surface, which forms the principal characteristic of true anthrax: the eschar extends, and sometimes acquires the size of both the palms of the hands.

If the patient have a very strong constitution, or if the disease be not very severe, the gangrene becomes defined, an inflammatory circle is formed around it, the eschar separates, and the general symptoms gradually diminish. If the disease have extended to a very great depth, much time is required to separate the eschar, which either exposes large nerves, blood-vessels, or bones, or includes them.

The treatment of this disease is the same, whether it be connected with plague or not. It has been proposed to cut out malignant carbuncle; but experience has shown the inutility and inconvenience of this practice, which is now discarded. If the incisions be confined to the gangrenous parts, the operation is perfectly useless, because it does not at all accelerate their separation. It cannot be done with a view of diminishing the putrid mass, for the dry eschar of malignant carbuncle is hardly susceptible of decomposition. If the living parts be cut, the operation is still useless, painful, and injurious; for the gangrene re-appears; it is even increased, by the operation. Sarnoclowitz, who extirpated and deeply scarified carbuncles, and finished by abandoning both these practices, in his *Memoirs on the Plague*, which appeared in Moscow in 1771, adds to the objections we have just stated, that the carbuncle sometimes extends to so great a depth, that both extirpation and scarification would involve large vessels: hence this patriotic physician contented himself with applying irritating digestives, and acrid oils, to the eschar and surrounding parts, and administering powerful internal remedies; means which, in his hands, proved successful.

ARTICLE V.

Of malignant Pustule.

Malignant pustule is a gangrenous inflammation of the skin, which rarely extends beyond the subcutaneous cellular tissue, and which is caused by a deleterious principle generated in animals affected with malignant fevers.

Malignant pustule is generally unique; however, sometimes several appear in the same individual.

This disease is very common in Lorraine, Franche Comté, and especially in Burgundy; but is not peculiar to these countries: it has even been observed in northern climates. It is generally frequent in low, marshy places, where many cattle are raised; it is epidemic after the heat of summer, when the inundation of the meadows has rendered the pastures bad, and covered them with mud, while they contain, at the same time, numerous dead insects. Animals who feed on such pasture, are affected with fevers, accompanied with gangrenous inflammation, which prove fatal very quickly. Not only the slightest contact of the gangrenous parts, or even of the fluids of animals thus affected, gives rise to malignant pustule, but even their skin, their hair, retain so strongly the contagious principle, that neither the process of manufacturing them, nor the circumstance of their having been preserved for a great number of years, is sufficient to destroy the deleterious principle. The simple contact of these substances is sufficient to occasion malignant pustule in any season of the year.

From what has been said, it is not astonishing that this disease is chiefly confined to shepherds, herdsmen, tanners, butchers, blacksmiths, and grooms; it affects exclusively, among these individuals, parts of the body habitually exposed; such as the face, neck, hands, shoulders, and bosom in women, the arms, feet, legs, &c. If there be examples in which the disease has appeared in other parts of the body, it is because they have been touched with the contagious matter: thus it has been known to appear on the back of a butcher, who having killed a sheep, and thrown him over his shoulders, received some blood on his shirt. A butcher's boy received the disease in his mouth, by holding his knife between his teeth.

In considering, 1st. That malignant pustule is never more common than during epizootic gangrene; 2d. That the small spot, similar to a flea-bite, the first appearance which takes place, commences always on the surface of the integuments, whence it extends gradually and successively to the mucous membrane, the dermoid and cellular tissues, acting from within outwards, like a caustic; 3d. That it is only seen on the face, neck, hands, and, in a word, on those parts which are habitually exposed to the impression of external agents;—in considering, I say, all these circumstances, the most distinguished practitioners have believed the disease to arise only from inoculation, and to be communicated by the contact of bodies impregnated with the virus; such as the hair, blood, and even excrements of animals affected with the distemper

which is called the *fire*, or any gangrenous fever whatever. Some have contracted it by skinning a hare, others from touching the tongue of a diseased cow; it has also been thought, and with reason, that insects might transmit the disease from infected animals to man. M. Thomassin, in his Dissertation on Malignant Pustule, says, that a woman, in dressing the sore of her husband, and having touched her face with her fingers, perceived, two hours afterward, a tumour on the cheek, which made alarming progress.

However, M. Bayle has endeavoured to prove that the disease may arise spontaneously, and without contagion. He assures us, that many patients, whose cases he relates, were certain that they had not touched any parts of an animal that had died of the disease, and that the malady had not even appeared among animals in the village, during the season when he made his observations: he, moreover, states, that most of the patients preserved their appetite, and did not infect persons with whom they slept. But, if we consider all the circumstances of the disease, it is easy to perceive that the existence of a variety of malignant pustule, depending on an internal epidemic, and non-contagious cause, is far from being satisfactorily proved.*

Morand speaks of two butchers who were affected with malignant pustule, after having killed two steers fatigued by a long journey, but otherwise perfectly well. The meat was good, and none of those who ate of it were injured. Thomassin relates a similar case, and Duhamel another. On the other hand, Messrs. Encaux and Chaussier adduce opposite facts, in which the gangrenous virus received into the stomach has affected this viscus, and produced sudden death; taken into the lungs by respiration, it has caused malignant fever, which has terminated fatally, with fetid evacuations, and gangrenous spots on the skin; at other times, it has produced carbuncle.

We shall distinguish the disease into four periods.

1st period.—When the contagious matter is first applied to the skin, there is neither tension, redness, nor heat in the inoculated part; a troublesome itching, a severe but transient stinging is felt; a vesicle forms about the size of a millet seed; it enlarges, and becomes brown; the itching returns at intervals; the vesicle breaks; reddish serum is discharged; the itching ceases some hours afterwards.

2d period.—A small, hard, moveable, circumscribed, flattened tubercle is formed, like a barley-corn; the colour of

* See note L.

the skin is not yet altered ; but in the centre of the tumour, and under the vesicle, it is somewhat yellowish, or livid, and granulated like some venereal pustules. To an increased itching is added a sense of heat, and smarting ; the tumefaction extends, and a salient circle is formed, sometimes pale, and others red and livid, or orange-coloured ; in other cases, the skin appears tense and shining, and covered with small phlyctænæ, which quickly run into each other. The central tubercle becomes brown and black ; it is a small eschar.

3d period.—The gangrenous point extends ; the areola enlarges, and rises around the eschar, which makes the centre appear depressed ; the tumefaction is neither inflammatory or edematous, it partakes rather of emphysema. Although there is no crepitation, the tumour is elastic, red, shining, and erysipelatous ; the acrid heat and stinging are succeeded by a numbness and stupor, and sense of weight, and the mortification extends deeply into the cellular tissue, below the skin.

4th period.—If the disease prove fatal, typhoid fever, of the worst character, appears ; the pulse is small, and concentrated ; the belly sometimes loose, sometimes constipated ; the patient experiences anxiety and sinking ; the tongue is dry and brown ; the thirst unquenchable ; low delirium and death follow. The body soon exhales a fetid odour, and the affected limb enlarges still more by the evolution of gas.

The duration of the different periods greatly varies in different cases ; sometimes they succeed each other in rapid and indistinct succession. The disease has proved fatal in eighteen hours. When it terminates favourably, it may last several weeks.

Malignant pustule must not be confounded with malignant carbuncle ; the cause of the former is external, that of the latter internal.

Malignant pustule is most dangerous when it is seated on the head or neck ; if the eyelashes be affected, great swelling of the eye, acute pains, and incurable deformity, result ; even the eye may be destroyed, and the disease, extending to the brain, may prove fatal. When the disease attacks the neck, it may suffocate the patient.

As soon as possible after the inoculation of the disease, we should scarify the parts to a sufficient depth, avoiding, at the same time, to cut into parts which are not affected with the poison, and giving rise to hemorrhage. When we are called in the beginning of the disease, after having made

the necessary scarifications, we should apply to the centre of the pustule a piece of lint as large as a pea, and wet with the muriate of antimony. At the end of six hours, a dry, hard eschar is formed, extending through the skin. The wound is to be dressed with simple ointment. On the next day, if there be no hardness, no areola, if the pain be slight, and unattended with burning heat, we may be sure the caustic has comprised the whole of the affected part, and simply dressing the wound will alone be necessary. If, on the other hand, after the application of the caustic, we see about the eschar, a hard, compact tumour; if a vesicular areola be formed, and considerable swelling have come on, we should make a crucial incision into the eschar, and remove the four angles, so as to facilitate the action of the caustic.

If an extensive eschar be formed before we are called, all the gangrenous parts must be removed before the caustic is applied. We must be careful, however, not to extend our incisions into the living parts, lest we induce a fatal hemorrhage. After these operations, the ichorous and bloody liquid with which the tissue of the part is filled, must be absorbed with lint; caustic is then to be applied.

In the fourth period of the malignant pustule, caustic is less efficacious than in the preceding; nevertheless, in this advanced stage of the disease, after proper scarifications have been made, recourse must be had to it. The scarifications ought to be made with great care; for, if they be too deep, there will be an abundant hemorrhagy, or dripping of blood, that will prevent the action of the topical remedies, and weaken the patient.

Some practitioners, deceived by the inflammatory appearances of congestion and tension, with which malignant pustule is always accompanied in the third and fourth periods, employ emollient applications; but this remedy, by suddenly relaxing the tense fibres, augments the obstruction, and hastens the progress of gangrene. Wise and enlightened practitioners never employ them; they make use of such applications as are proper to sustain the languishing vital action of the affected part, and favour the developement of a well-conditioned inflammation, and the establishment of the suppuration that ought to separate the dead from the live parts. The eschar and its environs must be dressed with a strong digestive spread on lint, and the part covered with compresses dipped in a tonic and resolvent liquid, such as camphorated spirits, with a poultice made with bark and camphorated brandy. These means are continued until the

swelling has subsided, and the eschar detached ; then simple dressings, as in the preceding case, are alone necessary.

As long as the malignant pustule is small, and has not exercised its influence on the constitution, it may be cured by a local treatment ; but, in a contrary case, to this treatment must be added general remedies, suited to the particular state of the patient and the symptoms of the disease. In general, the indications are the same as those of typhoid fevers ; the strength is oppressed, the sensibility, the irritability, and all the functions, are languid. Recourse must be had to energetic means to animate the vital powers, awaken the sensibility and irritability, and prevent the putrefaction of the humours. Bark, in substance alone, or added to camphor, or in decoction with mineral acids, according to the exigency of the case, is an excellent tonic, and, therefore, the most powerful antiseptic, and the most proper to fulfil the proposed object. If symptoms of saburra in the first passages exist, (a complication very frequent in the course of this disorder,) it is necessary to give an emetic before using bark ; but it is important to remark, that, in like cases, when the body is open, a vomit is improper ; it will not fail to aggravate this symptom, which, though rare, is constantly dangerous. After what we have already said, it would be useless for us to declaim against relaxing applications, bleeding, or purgatives, in the course of the treatment of this disease.

Whilst the disorder is in all its violence, the regimen must be severe ; the use of all animal soups is to be avoided ; barley or rice gruels alone should be permitted, with acid drinks and good wine—claret in preference, mixed with an equal quantity of water.

A great number of examples could be cited to confirm what we have said relative to the treatment of malignant pustule, but we shall confine ourselves to the following :—

In the year 1791, four persons, three butchers and a woman, the wife of one of them, purchased, near Paris, an ox that died by eating smutty corn or grain ; they dressed and divided it into pieces, which they privately introduced into the capital. This meat was sold, and the persons who bought it, and ate of it, were not incommoded ; but, in two or three days, two of the butchers were attacked with malignant pustules. This disorder manifested itself by a small pimple capped by a phlyctena, between the chin and an angle of the jaw. A physician and surgeon who were called, mistaking the disease for erysipelas, bled the two patients in the arm and foot, and in three days they both died.

The woman was attacked, almost at the same time, with the same disease; on her the pustule appeared on the anterior and superior part of the neck, under the base of the inferior jaw, and made rapid progress, so as to render respiration and deglutition very difficult. M. Larrey having been called, immediately knew the nature of the disease; but the case appearing to him very serious, he desired to have me in consultation. The patient scarcely breathed, the pulse was very feeble, and the weakness extreme. An eschar of considerable extent had taken the place of the vesicle. We scarified the gangrenous part, and touched the bottom of the scarification with liquid muriate of antimony, and administered tonics. The next day the patient experienced relief; the respiration became easy; the use of bark, in large doses, raised the pulse; the mortification, that had extended under all the anterior part of the neck, was stopped; the eschar was detached, and the cure was soon complete; but the loss of substance was considerable, and the cicatrix formed a chord that extended from the jaw to the clavicle, and kept the head inclined forward and on the side.

In the husband of this woman, the third butcher, the malignant pustule appeared on the middle part of the right cheek; caustic was immediately applied, which stopped the progress of the disease in the commencement; claret wine and bark was administered at the same time, and this last patient was soon restored to health.

ARTICLE VI.

Of Aneurism.

The name of *aneurism* is given to a tumour formed by the arterial blood, contained in a dilated, or discharged from an open artery.

When the blood that forms the tumour is still confined in the cavity of the artery, the coats of which are dilated, the disease receives the name of *true aneurism*; when the blood has issued from an open artery, it takes the name of *false aneurism*. This last is distinguished into primitive, consecutive, and varicose. In primitive false aneurism, the blood that has come out of an open artery immediately, or a short time after its being wounded, is infiltrated throughout the whole limb; in consecutive false aneurism, the blood that has come from the artery, sooner or later after

the wound, is effused into a sac formed by the lamina of the cellular tissue ; finally, in a varicose aneurism, the blood that forms the tumour, has passed from the artery into a neighbouring vein, by a common and parallel opening, and augments the diameter of this last vessel, by distending its coats.

Beside the true and false aneurisms, a third kind has been admitted, to which the name of *mixed aneurism* has been given. This last arises from the division or rupture of some one of the tunics of an artery, or the extension of the others. Two varieties of this pretended mixed aneurism have been distinguished : in one, the interior and muscular tunic is broken or divided, whilst the cellular sheath is extended ; in the other, on the contrary, the interior tunic is dilated in the form of an hernial sac, through the divided or broken muscular and cellular coats.

But it appears, as we shall presently demonstrate, that the true voluminous aneurism of long standing, is that which is described as the first variety of the mixed aneurism. We shall see, that, in both aneurisms, there is a period when the muscular and internal coats are broken, and that then the cellular coat alone, forming the sides of the aneurismal sac, is distended.

As to the second variety, to give an idea of its formation, it has been supposed that the cellular and muscular coats may be singly injured by some sharp instrument, such as the point of a lancet, or opened in some other manner ; and the interior tunic remaining entire, being too feeble to support the impetus of the blood, is distended, and pushed through the two others, as the peritonæum is pushed outside the belly by the intestines that are displaced in the formation of the hernia ; whence the expression, *aneurisma herniam arteriæ sistens*, employed by some persons to designate this pretended mixed aneurism.

The experience of Haller has been regarded as demonstrative proof of the dilatation of the exterior muscular tunic of the arteries, when their cellular coat is divided or destroyed, and that of the interior coat, when this last has alone escaped division or destruction. This celebrated physiologist says, he has frequently observed in living frogs, that when he raised the membranous tunic of the arteries of the mesentery, and destroyed the cellular tissue that surrounds them, they dilated in the form of aneurism ; which was equally the case after an incision, and particularly after a prick that affected only a part of the thickness of the coats of the vessel. But whatever skill he may have acquired by

long exercise and experiments on living animals, it would be difficult to persuade any one that he could be certain of not having divided the exterior tunie of vessels so fine as those on which he operated ; it is more than probable, that, in his experiments, he divided the partitions between the vessels, and that the formation of the tumour he afterwards observed, was only a false aneurism, which gave passage to the blood into the cellular tissue, into which it could only penetrate slowly, by reason of the narrowness of the opening.

It is evident that mixed aneurism does not exist, from the following considerations :—1st. If, after the rupture of the proper coats of an artery, the cellular tissue be distended in form of a sac, it is because it is at the same time very extensible, and little adherent to the muscular tunie ; it is also in consequence of these two properties that, when a large artery is tied, the cellular tunie resists, whilst the interior and muscular tunics are constantly broken. Now the internal tunie ought to resist most strongly the action of the ligature, as it is not immediately acted upon, if, like the cellular tunie, it slightly adhered to the muscular, and were susceptible of extension.

2d. If you push, with force, air or any liquid into an artery, the external and the muscular tunics are both broken, and the injected matter passes into the cellular sheath, which is distended.

3d. If the same experiment be made on an artery stripped of its cellular and muscular tunics in one or several points of its circumference, however careful the effort by which the injection is pushed, the internal tunie will always be broken, and not distended.

4th. Although an artery be uncovered, stripped, even by the effort of some accident, of its exterior cellular tissue, and remain in that state some time in the bottom of an ulcer, an aneurism is never the consequence. We have seen the brachial artery, after an anthrax, completely deprived of its cellular tissue : its beatings could be observed during ten days ; after which, the granulations hid it from view. The patient was cured, and never had an aneurism. In similar cases, on the contrary, the partitions of the vessel acquire a greater thickness from the effect of inflammation, and the diameter of its cavity diminishes.

5th. If, by design, the femoral or carotid artery be stripped of its cellular tissue in a living animal, and, after the cure, the vessel submitted to the experiment be examined, the result will be the same.

6th. Finally, the result will be the same, if an artery be stripped, not only of its cellular sheath but of its muscular tunic, as was done by Hunter, Home, and Scarpa;* it will be found, after the cure of the animal, that not only the internal tunic, that remained almost alone, has acquired, from the effect of the inflammation, a greater degree of thickness, but that, re-united to the adjacent cellular tissue, this membrane forms with it, in this part, a partition much more thick and compact than the partitions of the vessel in their natural state.

From what we have just said, it may be concluded, 1st. That what has been described as a mixed aneurism, formed by the rupture of the internal and muscular tunics of an artery, and by the dilatation of the cellular tunic, is nothing but true aneurism, at a certain point of developement. 2d. That the mixed aneurism, produced by the dilatation of the internal tunic, or of this and the muscular tunic, forming a sort of hernia, never did exist.

SECTION I. *Of true Aneurism.*

'True aneurism is a tumour, more or less voluminous, formed by the artery, or blood contained in a portion of the artery, the coats of which are dilated.

The opinions of authors and practitioners are divided as to the dilatation of the arterial coats in this sort of aneurisms, the dilatation being admitted by some, and denied by others. In this diversity of opinion, nothing is more proper to give exact notions, conformable to truth, than an anatomical inspection of the affected organs, and this is what we learn from this source. If a recent and small true aneurism, about the size of an olive, be examined, it will be observed, that above and below the tumour the artery preserves its natural diameter. In the tumour the coats are removed from the axis of the vessel, sometimes around the whole circumference of the arterial tube, but most frequently at one point. In this last case, the rest of the circumference of the artery preserves its natural relation with its axis, whilst the affected part discovers, on the inside, a sort of fossa or excavation, that differs from the rest by this circumstance only. The internal tunic extends without interruption, over the whole internal surface of

* See Reflections and Observations on Aneurism, by Scarpa, translated by M. Delpach; a work which cannot be too strongly recommended to surgeons who wish to acquire a profound and solid knowledge of aneurism.

this fossa, and the muscular embraces the point, slightly distended, as the rest of the circumference of the artery. In this case there is no rupture, and if the artery, thus dilated, be split, it will be found that the thickness and consistence of its coats is rather augmented than diminished, and, consequently, that the dilatation does not take place at the expense of the thickness of the arterial tunics. The blood contained in this part of the dilated artery is not coagulated, except after death; but the cavity in question, is too small to retard its movement, and therefore allows it to stagnate. Such was the state of an aneurismal tumour in its early stage, that I had occasion to observe in a subject who died in consequence of an aneurism of the femoral artery; and in another who died a long time after having been cured of an aneurism in the popliteal artery.

If true aneurism be chronic; and if after having been of a small volume for a certain time, it suddenly take a rapid growth, whether in consequence of some effort, or from some unknown cause, it will at first be found that the aneurismal sac is formed entirely of cellular substance, continuous with the external or cellular sheath of the artery, and with the surrounding cellular tissue, that may be distinguished from them by its greater density and thickness. This thickness is not the same in every part of the sac; it is generally less in the point corresponding with the skin, and it is there the rupture takes place, when the aneurismal tumours spontaneously open. This sac is easily known for the cellular or external tunic of the artery, distended and grown by the super-position of the lamina of the adjacent cellular tissue, distended in its turn, and compressed by the tumour. If this sac be split open, it will be found filled with blood, partly liquid, and partly coagulated. The volume and the density of this last, is always proportioned to the time which the disease has existed. The coagulum is disposed sometimes in layers over each other, of a fibrous texture and appearance; the nearer the sides of the sac the more compact, some being very adherent to this partition; sometimes it forms an entire mass, the consistence of which is almost uniform. The aneurismal sac being emptied of the fluid or extravasated blood it contained, it is observed that its internal surface is at times smooth, and polished; in other cases soft, downy, reddish, of a bloody cast, and difficult to clean. The muscular and internal tunics of the artery will be found broken and torn in the bottom of this sac: the opening that results from this rupture, and by which the arterial tube communicates with the sac, is

more or less large; sometimes round, or any other regular form; sometimes irregular: the borders of this opening are sometimes so large as to represent a sort of partition pierced in its centre; most frequently they resemble a cock's comb, and have the appearance of being fringed, or festooned; sometimes they are smooth, and similar to the orifice of a fistula; finally, sometimes they are flattened and confounded with the cellular aneurismal sac, from which, however, they are distinguished by the ridge which marks their limits. The sac is always larger than the opening: the collateral arteries above the tumour are dilated. Being charged to dissect the inferior extremity of a man, on whom the celebrated Dessault had, eight months before, operated for aneurism of the popliteal artery, according to Anel's method, I found in the thickness of the sciatic nerve, an artery, the diameter of which was equal to that of the radial at the wrist. This artery that came from the sciatic, descended quite to the posterior part of the knee, where it anastomosed with the superior articular arteries; I had, besides, observed on this subject, before the operation, that one of the branches of the superior internal articular arteries was so dilated, that its beating could be easily felt on the internal condyle of the femur.

If we could reason from analogy as to the nature of organic lesion, the following considerations might be added to anatomical notions derived from dissection.

1st. All the tissues that compose the organs of animals, enjoy an extensibility and an elasticity suited to their particular uses. Is it reasonable to think the arteries are deprived of these properties? Cannot their movements of diastole and of systole be regarded, to a certain degree, as resulting from these properties? The points of support, the bony furrows that support or contain the vessels that describe curves, as the posterior part of the knee for the popliteal, the anterior part of the joint of the elbow for the brachial, the canal for the carotid, the lateral parts of the atlas for the vertebral, &c. are they not so many means employed by nature to prevent the dangerous effects of the lateral impetus of the blood on these curved points of the arteries?

2d. The small exeavations, like the impression of a finger, on the internal surface of the aorta, opposite to the sygmoid valve, and known by the name of the small sinus of the aorta, do not exist in the fœtus, but are formed as the subject advances in age: it is the same with the great sinus, which, in certain old persons, presents a considerable extent.

If the dilatation of certain determined points of the circumference of an arterial tube cannot be considered as the commencement of so many aneurisms, do they not furnish undoubted proof of the possibility of the simultaneous dilatations of all the tunics of the arteries, even in their natural state?

3d. If, in the experiments that have been made to prove the extensibility of the arterial vessels, the coats have always been found broken, and never dilated, does not this circumstance arise from the nature of the process, naturally sudden in its action, whilst, in the formation of an aneurism, the force capable of effecting the dilatation acts slowly, and in a successive manner?

4th. The several organic alterations that have been observed in the arterial system, are they not sufficient for us to conceive a diminution in the natural consistence of the partitions of the arteries, that permits them to distend to a certain point?

5th. The indubitable proofs of ulceration of the coats of the arteries, by destroying a portion of the vessel that was at first dilated, have they not given rise to doubts as to the reality of that dilatation?

6th. Finally, the small volume of true aneurism, before the rupture of the proper tunics of the artery, does it not accord with the absolute impossibility of obtaining a dilatation of these organs in their natural state?

After what has been said, it may be concluded that the simultaneous dilatation of all the coats of an artery, whether in the whole of its circumference or in a circumscribed space, is an incontestable truth, and, consequently, that there really exists a species of true aneurism.

On reflecting on the great number of cases of aneurism, where the proper tunics of the artery have been found destroyed or broken, and the small number of those where the dilatation of the coats has been verified, we are tempted to believe, with *Monro*, that this kind is very rare. If, however, we consider that the internal and muscular coats, as we shall presently show, are susceptible only of a slight degree of extension, beyond which they constantly break; that it is always the effect of an internal cause, which destroys their natural resistance; that these tunics are distended; that the internal coat has the greatest analogy with the membrane that covers the internal sac or surface of all hollow organs; that this last is very subject to chronic inflammations, diminution of tension, and to ulceration; that the celebrated *Desault* had occasion to witness the chronic

inflammation of the internal membrane of the aorta, accompanied by congestion in the other tunics ; that the works of a great number of observers, worthy of belief, are filled with facts which attest the ulceration of the proper coats of the arteries ; that the artery has been found destroyed in a great part, or the whole of its circumference : if all these circumstances be considered, we shall be led to believe, that, in a great number of aneurisms, the disease having commenced by a relaxation in all the tunics of an artery in a point of its circumference, the same external cause that produced this first effect, afterwards causes an ulceration in the same point. It is very probable this last affection will have destroyed the greatest part of the dilated coats, so that on examining the tumour at an advanced period of the disease, it is no longer possible to discover the dilatation.

However it may be, this is the course of this disorder. It begins with a small tumour, in the first instance indolent, circumscribed, totally disappearing on pressure, and re-appearing as soon as the compression ceases, without any alteration in the skin that covers it : it is situated on the passage of an artery, and accompanied by beatings synchronous with the pulse. When the artery is compressed above the tumour, these beatings cease, and, at the same time, the tumour sinks and disappears ; but, on the contrary, when the compression is made below, the hardness of the tumour increases, and the beatings become stronger. The appearance of aneurismal tumours in some persons is preceded by a numbness and torpor of the member, and even by pain, accompanied with convulsive contractions in the muscles of the affected parts ; but it is not easy to decide whether these symptoms specially precede the aneurisms by the dilatation of the tunics of the artery, or of those by erosion or the spontaneous rupture of them. But most frequently, when the aneurism is not voluminous, it is unaccompanied by pain, and the movements of the limb are as free as in its natural state. The tumour augments slowly ; sometimes several months, and even a whole year, pass away before it acquires a volume equal in size to the fist.

There is, however, a period when the progress of the aneurism becomes much more rapid. In consequence of some effort, more or less violent, it acquires, in a few weeks, a volume double or triple of that to which it had arrived in several months. Sometimes the patient can perceive the moment when the rupture of the proper tunics of the artery happens, either by a sensation of tearing in the seat of the tumour, or a noise similar to that caused by tearing cloth.

The tumour is then less circumscribed, its limits are less distinct ; it becomes hard and often uneven ; compression does not entirely make it disappear ; that of the artery produces but a slight diminution of its volume ; the beatings become more and more obscure, and change to a trembling, difficult to distinguish, and in some rare cases entirely imperceptible. At the same time pains are felt in the tumour, and the limb above and below the seat of the disease becomes enlarged ; the edema keeps pace with the aneurism, and motion becomes extremely painful and difficult. When the tumour has arrived at the highest degree of development, the member is not only very much swollen, but becomes numb and cold. The superficial veins are dilated and varicose ; the centre of the tumour rises to a point ; the skin that covers it becomes red and brown ; it is extremely distended, and becomes thinner daily ; a gangrenous point appears in the middle of this inflammation ; the eschar is detached as soon as formed, and the patient perishes in a few instants by hemorrhage.

On examining an aneurism which has reached this extreme point of development a short time previous to its rupture, the skin will be found very thin, and apparently confounded with the aneurismal sac. The cellules of the cellular tissue are infiltrated with serum, or totally effaced by the mutual adhesion of the cells, according to the degree of distension the skin has suffered. The neighbouring muscles, whether they cover the aneurism or laterally surround it, are distended, displaced, thinned, and sometimes confounded with the adjacent parts. It is the same with the considerable nervous cords near the tumour, which are displaced, thinned, and sometimes adherent to the exterior of the aneurismal sac, and so diseased as not to be known. Finally, the cartilages, and even the bones themselves, are gradually destroyed without the smallest trace of their substance remaining ; in the same manner as the bones of the cranium are destroyed by the fungous tumours of the dura mater,—a singular phenomenon, of which a satisfactory explanation cannot be given, even allowing the action of the absorbent system. The cartilages of the larynx, and the rings of the trachea have been seen destroyed, this tube pierced, and the blood of the aneurismal tumour has entered at this place as well as by the esophagus. We ought not to omit to mention, among the effects of aneurismal tumours, the dilatation of the vessels above the aneurism, and of their anastomosis with the veins that arise below it. This always takes place when the disease has continued a certain length of time,

and may be placed among the circumstances most favourable for the operation.

After what we have just said, it is easy to understand the pathology of true aneurism, and to explain the phenomena of its developement. Its progress is slow in the commencement, because then the tumour depends on the simultaneous dilatation of all the tunics of the artery, and the internal and the muscular coats are very unyielding. The softness, the compressibility of the tumour, and its disappearance when compressed, is explained by the fluidity of the blood it contains. The rapid growth of the aneurism at an undetermined epoch of its existence, arises from the rupture of the internal and muscular tunics, and from the great extensibility of the cellular tunic, which then forms the aneurismal sac, and resists alone the lateral impetus of the blood. The hardness, the inequality of the tumour, the impossibility of entirely reducing it, the obscurity, and even complete disappearance of its pulsations at a more advanced period, arise from the stagnation and coagulation of blood in the cavity of the aneurismal sac. The dilatation of the collateral branches depends on the obstacles offered to the progressive movement of the blood by this coagulation. The difficulty of passing from that part of the artery which is above the tumour into that which is below it, causes the blood to penetrate in greater quantities, and with more force into the collateral arteries: thus it gradually distends them. Sometimes the coagulated blood that fills the tumour is perforated by a very small opening, through which only a very small quantity of blood passes; the artery is then always narrowed below its dilatation, while the collateral branches are very large. If the cases in which it is pretended that the collateral arteries were found of their natural dimensions, after a successful operation for aneurism, be correct, they prove that the dilatation of these arteries is not a constant occurrence, and that their natural communications, and those of the minute cellular tissue, may suffice to preserve the circulation of a limb. The pains that are felt in the tumour, arise from the distension of the surrounding parts; and those the patient experiences in the passage of the principal nerves of the member, evidently depend upon the twitching of these last, displaced by the progress of the aneurism. It is also to this last cause that must be attributed the numbness of the limb, the compression of the veins and the lymphatic vessels causes the varicose state of the first, and the edema and coldness of the member. As to the destruction of the bones and the cartilages, which, by

their resistance, tend to prevent the developement of the disease, we shall not undertake to explain it. We shall only observe, that the beatings of the tumour must be the principal cause, since this destruction is scarcely observed, except in aneurisms and in tumours to which the action of the heart or the great vessels communicates a pulsatory movement; such, for example, as the fungous tumours of the dura mater.

Aneurism is almost always single or alone. Sometimes, however, several are seen on the same subject. A man that died several years since at the hospital of La Charité, of an aneurism of the crural artery, had another of the size of a nut in the popliteal. Persons have been seen, in whom most of the great arteries were affected with aneurism.

There is hardly any one internal artery that may not be attacked with aneurism; but the aorta is that in which this disease is most frequently remarked; and the cross of this artery is more generally the seat of it, than any other part of its extent; it is not, however, very rare to see aneurism of the descending thoracic and ventral aorta. This disease much more rarely affects the cæliac artery, the iliaes, and subclavian arteries; as to the external arteries, it would be difficult to mention any considerable one, in which true aneurism has not been observed.

But in general the arteries are more subject to this disease, as their diameters are more considerable: thus the femoral, popliteal, axillary, and brachial arteries, are more frequently attacked, than the arteries of the leg, the foot, the lower arm, and the hand; the common carotid, more frequently than the internal and external carotids; and these more frequently than the other arteries of the head.

I have seen an aneurism of the posterior auricular artery, on a woman of thirty-six years of age: the tumour was situated between the ear and the upper part of the mastoid process; it was of the size of the end of the little finger; round, circumscribed, without change of colour to the skin, soft, compressible, and attended by pulsations, synchronous with those of the pulse. Compression caused it to disappear, but the moment the compression ceased, it re-appeared, with a hissing noise. As it had not made any progress for a long time, I advised the person to do nothing with it.

In general, when aneurism is recent, the tumour is of small volume; it is so small in the commencement of the disease, that it is frequently difficult to distinguish it through the soft parts with which the artery is covered. This tumour augments by degrees, but its progress is very slow

until the muscular and internal tunics, distended beyond their natural extent, break; at this moment the tumour, all at once, considerably increases, and it sometimes acquires an enormous volume, before it opens externally.

The slow and gradual increase of aneurism in its beginning, and before the rupture of the muscular and internal tunics, and its rapid augmentation after those tunics are broken, merits the greatest attention in forming a prognosis.

The affected artery has no influence on the form of the tumour. This form solely depends on the resistance of the surrounding parts; it is only after the rupture of the internal and muscular tunics, that this resistance can influence the form of the aneurism: before this epoch, the small size of the tumour permits its developement in all directions, it, therefore, always preserves its globular form, or, at least, it varies very little from a regular sphere. But when the cellular tissue alone forms the partitions of the cavity in which the blood is contained, the tumour, as we have already said, makes a rapid progress; and this progress would be still more rapid, were it not supported by the bones, the aponeurotic expansions, the tendons, and the muscles that surround and press upon it. But as these parts never exactly embrace the aneurism in all its circumference, it follows, that the points which are least supported extend most. The relation of the tumour with the adjacent parts, being different, not only according to the affected artery, but according to the part of that artery, it is impossible to determine, in a general manner, the influence the situation of the disease may have on the form of the aneurism.

We have already observed, that when aneurism is recent, and of a small size, it does not generally cause either pain or constraint in the motions of a member. The disease is then in its state of simplicity; but as it increases, it acts on the surrounding parts, and produces effects that may be considered as true complications. Thus the twitching of the saphena nerve, in aneurism of the femoral artery, frequently causes violent pain in the passage of this nerve even to the great toe; the distension of the sciatic nerve, by aneurism of the popliteal artery, sometimes occasions intolerable pain in all the parts to which this nerve is distributed, which generally cannot be calmed by narcotic applications; the compression of the sanguineous veins and the lymphatic vessels, gives rise to edema, numbness, and coldness in the limb; the distension of the skin excites inflammation of that part, and sometimes even of the tumour; finally, the long com-

pression that the aneurism exercises on the neighbouring bones, which, by their position, tend to confine its growth, brings on their destruction. J. L. Petit saw the condyles of the femur, and the superior extremity of the tibia, almost entirely destroyed by an aneurism of the popliteal artery.

The lateral impulse of the blood against the coats of the arteries, at each contraction of the heart, is the efficient and immediate cause of true aneurism; and this cause is rendered more energetic by every thing that augments the momentum of the circulating mass. But before the lateral effort of this liquid can remove the sides of an artery farther from its axis, and thus give birth to a true aneurism, the tissue of the coats must be weakened to some extent, either in the whole circumference of the arterial tube, or in a part only.

This weakness of the tissue of the coats of an artery may depend on external causes; such as a violent strain, too strong extensions, contusions by a fall or a blow; but most frequently it is produced by internal causes, the existence of which cannot be contested, although their nature and manner of acting are unknown. Relations, more or less distant, have been observed between syphilis and aneurism. It has been thought the continued use of mercury has some influence on the formation of this disease; but these observations are still far from having a demonstrative character.

The curvature of an artery, when it is considerable enough to retard the progressive movement of the blood, augments the impulse of this liquid against its coats, and may consequently favour the developement of aneurism. It is generally thought this disease is not so frequent on the cross of the aorta, because the blood strikes against the convexity of this curve, at each contraction of the heart, and constantly tends to separate the arterial coats from their axis, and to extend them beyond their natural extensibility. The compression which swelled and hardened muscles exercise, in contracting on the arteries they cover, by retarding the progressive movement of the blood, and augmenting its natural impulse, may contribute to the developement of aneurism, particularly if it take place immediately below the spot where an artery is surrounded with a great quantity of the fatty cellular tissue, as the popliteal artery, in the middle of the hollow of the ham.

True aneurism appears under the form of a tumour more or less voluminous, ordinarily indolent, circumscribed, equal, compressible, and elastic; the progress of it is always slow and gradual, until the moment the muscular and inter-

nal tunics break : this happens at an epoch which it is impossible to determine. The tumour, situated on the course of one of the principal arteries of the member, is accompanied by beatings synchronous with those of the pulse, and felt equally in all situations of the part ; it is susceptible of diminution, and even of entire disappearance, when compressed, as well as by the compression of the affected artery above the seat of the aneurism ; it augments, on the contrary, and its beatings become stronger, by the compression of this artery below ; it interferes but little with the movement of the member, and is not accompanied by any alteration in the colour or natural heat of the skin.

After having remained a longer or shorter time in the state we have just described, true aneurism undergoes changes that modify its phenomena in a very remarkable manner. From an effort more or less violent, or from an unknown cause, the tumour makes a much more rapid progress. Sometimes, on this occasion, the patient experiences a sensation of tearing, or he hears a noise similar to that produced by tearing cloth. The tumour then becomes more voluminous, and every day makes new progress ; it is moderately hard, unequal, of a form more or less different from a globular, and compression does not now make it disappear ; its pulsations become more and more obscure, particularly at its circumference ; they are sometimes reduced to a slight trembling, and sometimes even they totally disappear : this, however, never happens, but when it is very ancient, and large. Compression of the artery above the disease, causes the beatings of the tumour entirely to disappear, but it makes no change in its size ; the skin that covers the aneurism is more or less distended, thinned, sometimes inflamed, and even covered with a gangrenous spot ; the patient experiences pains in the tumour, and in the rest of the limb ; the veins under the skin are preternaturally dilated ; the limb is more or less swollen, sometimes benumbed, and even cold.

Symptoms so numerous and so characteristic, ought, in all cases, to suffice to make known this disease, and prevent all kinds of mistakes. We have, however, a great number of cases, in which aneurismal tumours have been mistaken for abscesses, and, in consequence, have been opened by an incision, that has been promptly followed by the death of the subject. So serious and fatal an error could hardly be committed, in the commencement of an aneurism, by an attentive and skilful surgeon ; for then the beatings of the tumour, and its disappearance when compressed, so well

characterize it, that no doubt can exist of its nature. But when the disease is more advanced, and the tumour has become much larger, and is filled with polypous concretions; when the pulsation is no longer felt, and compression effects no change in its volume, it is then difficult to know it. In this stage of the disorder, it is only by an attentive examination of the circumstances that have preceded the actual state of the disease, that sufficient knowledge can be acquired for us to pronounce on its true character. Careful information ought to be had of the manner in which the tumour was formed, of the phenomena it presented in its commencement; and if we then learn that it was at first very small, that it augmented by degrees, that afterwards, from some effort or unknown cause, it suddenly acquired considerable size; if, in the commencement, it had a pulsation which gradually diminished, and, at last, finally ceased; if the compression that at first made it disappear, or at least diminished its size, now cause no change, it is certainly an aneurism. But, in most cases of aneurism arrived to the degree in question, we can very seldom draw from the patient sufficient information to remove all doubt as to the nature of the disorder; the difficulty of the diagnosis is still greater, when the tumour presents no one of the characters of aneurism, and when, on the contrary, it appears in the form of an abscess. Delaen reports a case of this sort, that deserves to be known. A man was attacked with erysipelas in the foot, which successively extended to the leg and ham; the swelling, in this last region, did not disperse, and a tumour formed, that appeared to pass very slowly to a state of suppuration. Near two years after, fluctuation was manifest, but there was not the slightest pulsation. A small opening was made in the centre, and pus was discharged: the tumour did not much diminish in size. Things remained in this state a few days; but, eight days after, a hemorrhagy unexpectedly came on, and the patient expired. The dissection of the member proved that there was an aneurism; the sac and coagulum of which were surrounded by an abscess; and it is probable the edema that succeeded the erysipelas, and which was perhaps kept up by the presence of the aneurism, hid the knowledge of the symptoms of this last-mentioned disease. In the same manner ancient aneurisms, more or less voluminous, and in which the pulsation is no longer to be felt, may be mistaken for tumours of some other kind; and, on the other hand, humoral or other tumours, situated over large arteries that communicate to them their pulsations, may be easily

confounded with aneurism. The history, however, of the disease, and the proper character of the pulsation of the tumour, may furnish sufficient indications to discover its true nature.

Aneurism, in its commencement, presents a soft tumour, capable of being made to disappear by compression ; all other tumours, on the contrary, are the more consistent the less they are advanced, and do not disappear during compression. As aneurism becomes chronic, it loses its softness, and, at same time, augments in size ; and this change in its consistence takes place always from the circumference towards the centre, so that this last point is still soft when the base has acquired a degree of hardness. In the humoral tumours, on the contrary, which soften by the progress of suppuration, the fluctuations always appear in the centre, and extend towards the circumference, so that the extent of the softened part of the tumour is always proportioned to the time of its existence. In aneurism, in whatever position the limb be placed, the pulsations are perceptible ; in tumours of another nature, which have beatings derived from the pulsations of a neighbouring artery, this phenomenon becomes insensible, by an attitude that causes the relations of the vessel with the tumour to cease. The beatings of aneurism are most remarkable when the tumour is least voluminous, and the disease recent, because it then contains but little coagulated blood ; the pulsations of humoral tumours, on the contrary, are stronger as they become more voluminous, because they more forcibly press the adjacent vessels, and increase the lateral impetus of the blood. The pulsations of aneurism are the true efforts of expansion or dilatation, sensible in all its circumference, when the tumour is not of long standing, and very large ; sensible only in its centre, and obscure or imperceptible in its base, when the sac of the aneurism is covered with thick skin. But the pulsation of humoral tumours results from the displacement of the whole mass ; it is sensible in all its extent, and perpendicular to the axis of the vessel that communicates it.

From what has been said, it results that, in many cases, it is impossible to pronounce, in a positive manner, if a tumour, placed over a large artery, be an aneurism, or a tumour of another nature. In this doubtful case, we ought to conduct ourselves as if the tumour were really an aneurism. In conforming to this rule, it will no doubt happen that sometimes we shall not touch tumours, the opening of which is proper and safe. But the inconveniences that may result from this, are not comparable with the danger to

which the patient would be exposed, by opening an aneurism instead of a tumour of another nature. Great prudence and circumspection are to be particularly observed in the treatment of those tumours which appear on the trunk, neck, in the arm-pits, or groin; for in those which are so far situated from the trunk, that, by pressing the principal artery of the member above the tumour, we can become master of the blood; we may then act with more boldness, and practise all the operations indicated by the state of the disease. But before opening a tumour, it is necessary to be furnished with every thing proper to suspend the course of the blood, and tie the artery, if the disease should be found to be aneurism.

The prognosis of aneurism varies according to several important circumstances: in general, this disease is very serious; for, if abandoned to itself, the patient dies by the rupture of the sac of the aneurism and the effusion of blood. Some examples, however, of spontaneous cures are known. Aneurismal tumours have been seen spontaneously to cease to pulsate, grow hard, insensibly diminish in size, and become reduced to an indolent tubercle, and even to completely disappear; and, at the death of the subject, the artery has been found obliterated, and converted to a ligamentous cord, without the least vestige of aneurism remaining. Tumours have been sometimes seen to inflame, ulcerate, and, instead of blood, discharge nothing but matter, the evacuation of which has been followed by a radical cure of the disease. The aneurismal tumour, and the parts around it, have been known to mortify; and the separation of the eschars, and of the aneurism, has been followed by a perfect cure. Finally, tumours, presenting all the characters of aneurism, have disappeared during the use of compression too feeble to intercept the course of the blood. But if all the observations of this kind have related to tumours truly aneurismal,* these facts (of which we cannot conceive the result, without admitting that the inflammation

* Among the facts in question, there are some where it cannot be contested that the tumour was aneurismal, and that nature effected the cure. The respectable Lassus, whose memory is dear to us, has collected some interesting cases, (*Med. Operat.* vol. ii.) J. L. Petit, in the *Memoirs of the Academy of Sciences*, relates an example of an aneurism of the common carotid spontaneously cured, and in which he was convinced, after the death of the subject, that the artery had been converted into a ligamentous substance. But tumours of another kind have often been mistaken for aneurism. Chaptal relates, with candour, that he had committed a similar error on the subject of a tumour in the hollow of the ham, that gradually disappeared; and that he should have regarded this fact as the spontaneous cure of an aneurism, had he not been convinced to the contrary by a brother practitioner.

and swelling have been sufficient to obliterate the affected vessel,) offer too small a number of exceptions to invalidate the general propositions I have laid down. Art, however, possesses the proper means to effect a cure of this disease; and the greater or less difficulty of applying those means renders the prognosis more or less serious.

In general, all external aneurisms, placed so near the trunk that the affected artery cannot be compressed or tied above the tumour, are incurable. We must not, however, believe that all aneurisms which appear too near the trunk to admit of an operation, are actually in this situation, and leave no resource: the extent of the tumour particularly ought not to be taken as a rule of the prognosis in this respect; for, whatever be the size of the aneurism, the extent of the injury of the artery is never proportioned to the volume of the tumour; it is, on the contrary, limited to a few lines, or at most to an inch. Now, if, to this observation, we add another which has instructed us, that the injured point of the artery always corresponds to the centre of the tumour, or a little below it, it will be seen that, in certain aneurisms, where the operation appears impracticable, for want of sufficient space to exercise compression above the tumour, not only the course of the blood may be suspended in the affected vessel during the operation, but further, that, by calculating the probable situation of the injury of the artery, and comparing it with the point of origin of the principal branches of communication, we may determine if there remain a sufficient quantity of the artery on which to place the necessary ligatures, and if the obliteration of the principal vessel may be attempted with hopes of success, which is most commonly the case. It cannot, however, be said that aneurism is always least serious when it is at a distance from the trunk; that of the popliteal artery, for example, situated low enough to affect the inferior articular branches, is more dangerous than that in the middle of the femoral, and even in the superior part of this last, below the origin of the profunda; because, in this last case, the anastomoses, which must supply the principal trunk after its obliteration, are free; and in the first case, on the contrary, the last anastomotie branches, on which depends the circulation of the blood, are comprised in the disease.

The cure of aneurism generally depends on an operation that uncovers the vessel: the more deep the affected part of the artery is situated, the more serious is the disease, from the inevitable disorder caused by cutting down to it. Thus popliteal aneurism is more serious, other things being

equal, than that of the femoral artery. We shall soon see that the cure of aneurism can only be obtained by the obliteration of the artery affected with it. The circulation of the blood must take place by the anastomoses of the superior and inferior collateral arteries, otherwise the limb mortifies. Now, experience having shown that the difficulty which the circulation experiences in an artery attacked with aneurism, by the compression of the tumour itself, causes a reflux of the blood by the collateral branches; the dilatation of these branches, and the existence of the disease for a long time, may be regarded as favourable to the success of the operation; in fact, the most fortunate operations for aneurism we have had occasion to perform, have been on patients that have had the disease a long time. A recent aneurism, however, has also its favourable side; for, in this case, the method of compression may be tried; while it is almost always impracticable, and sometimes even dangerous, at a more advanced period of the disease.

True external aneurism is least embarrassing when it is exempt from considerable pain and tumefaction. These accidents, however, are not very unfavourable, particularly if they be not joined to a considerable coldness of the limb; for they generally disappear after the aneurismal tumour has been emptied.

The erosion of the bones in the vicinity of the tumour, is a much more serious complication than all the others, and sometimes renders necessary amputation of the member.

An anatomical examination of the bodies of persons who have died after having been cured of aneurism by art, or by the efforts of nature, has shown that the affected artery is constantly obliterated, and converted into a ligamentous cord, or into a cellular substance, from the most considerable superior collateral arteries down to the inferior; so that the blood cannot go from the upper part of the principal artery into the lower, without passing through the collateral arteries, the calibres of which are then more considerable than in their natural state. It may, therefore, easily be conceived, that an aneurism can be cured only by procuring the obliteration of the artery, as well in the place of the tumour, as above and below that place, even to the collateral branches of a certain diameter.

The mechanical means proper to produce this obliteration ought to act on the affected artery above the tumour, and prevent the blood from arriving in the aneurismal sac. It is evident this treatment cannot be applied to internal aneurisms; or to external aneurisms, when they approach so

near the trunk, that the artery cannot be compressed above the disease. Some, however, have had confidence enough in their skill, and coolness, to undertake the operation for aneurisms too near the trunk, to permit the suspension of the blood by compression. Guattani fortunately executed this hazardous enterprize, on an aneurism of the femoral artery, contiguous to the crural arch; and in order to be ready to compress the artery against the os pubis the moment it was laid bare, he confided the opening of the sac to another surgeon; but what prudent operator would imitate such conduct? How could Guattani be certain that there remained enough of the artery in a sound state, below the crural arch, for him to be able to compress this vessel? On what a trifling circumstance the unfortunate issue of such an operation depended! had a moment been lost, the patient would have expired under the eyes of the operator. The exercise of our profession would certainly be too painful, could we not restore health to mankind, without exposing them to similar dangers.

We can only palliate cases of this nature, and delay the fatal termination of the disease; all that can be done is to moderate the impetus of the blood, when it is too great, by bleedings and very low diet; to avoid every thing that can augment the heat and accelerate the course of the blood, to keep the body open by means of injections, and even gentle laxatives; and, lastly, to calm the pain by means of opiates.

It has been thought that this palliative treatment, aided by some changes and internal medicines, might cure small and recent internal aneurisms, and even those that are external, voluminous, and of long standing, in which prudence does permit us to attempt an operation. This idea originated with Valsalva: his method consists in gradually weakening the patient, and leaving in the vessels only enough blood to support life. With this view he confines him to his bed, bleeds him frequently, and gradually diminishes his aliment, until he reduces it to half a pound of boiled flour and milk in the morning, and a little less in the evening, and allows him only to drink water, to which is added a little jelly or syrup of quinees. When, by the effect of this regimen, the patient is reduced to such a state of feebleness that it is impossible for him to lift his hand from the bed, he progressively augments the quantity of aliments, and increases his strength very slowly to its natural state.

Albertini, in the first volume of *Commentaries of the Academy of Bologna*, details the method of Valsalva, and

cites cases which he thinks favourable to the good opinion he had conceived of it, even before it had been put in practice.* Of five observations cited with very few details in this memoir, two only are accompanied with dissections. One relates to a man of quality, who, having submitted to this treatment, lived, with an internal aneurism, from the age of sixty-five to that of seventy-four. On opening the body, the right auricle of the heart and the pulmonary artery were found of an inordinate size. The second is concerning a woman, in whom the aneurism appeared at the age of sixty-one, and who lived until the age of eighty-two years. On opening the body, an aneurism, on the trunk of the aorta, was discovered, and the coats of the vessel, in this point, converted into bone: "*cum aneurysmate in trunco aortæ, crusta ossea intus undique obducta.*" The confidence with which this method inspired its author, is not founded on any positive fact, and it can only be considered as palliative; it would be absurd to hope for a cure founded on the contraction of the sides of the artery to their natural state, and the re-establishment of the vital properties they have lost. Besides, even if we suppose that the coats of the arteries, simply dilated, can contract and return to their natural state, in proportion as the quantity of blood diminished, how can we discover an internal aneurism, while the disease yet consists in the simple dilatation of the coats of the artery? And if the aneurism be so far advanced as to leave no doubt of its existence, (which always supposes the rupture of the muscular and internal tunics,) how can we conceive a possibility of cure by Valsalva's method? To these considerations we shall add another, which appears of the greatest importance. This method, from which advantage may be derived in particular circumstances that have not yet been determined, has been recently twice tried at the Hotel Dieu, at Paris; the first, on a subject that had an aneurism of the axillary artery, which could not be operated upon by reason of its situation; the second, on a woman who had an aneurism of the ventral aorta. In both cases, the tumour was large, and its coats identified with the adjacent cellular membrane, and the surrounding cellular tissue. In these two aneurisms the progress of the tumours was much more rapid, and the rupture took place precisely at the time the treatment was carried as far as possible, and at the moment it ought to have given the greatest

* Albertini and Valsalva devised this method while they were students, and they reciprocally promised each other to try it on the first occasion that presented. The first fell to the lot of Valsalva.

hopes. If similar facts multiply, will they not demonstrate that the palliative treatment, carried to excess, is, in like cases, more injurious than useful, and that a certain progress in the tumour is a positive contra-indication to its use?

Nevertheless, the method of Valsalva, seconded by astringent applications, employed with a view to retard the progress of external aneurisms which cannot be operated upon, has sometimes radically cured them. In the *Treatise on Operative Medicine* by Professor Sabatier, is found an example of this success. A false consecutive aneurism was situated before the humeral extremity of the clavicle, and of a very great size; it was cured by rest and a severe regimen, seconded by the internal use of Helvetius's alum pills, of a drink strongly charged with eau-de-Rabel, and by the application, on the tumour, of a small sack half-filled with fine powder of tan frequently dipped in strong red wine. We have ourselves seen a barber of Bourgogne street, that was cured of a commencing aneurism of the popliteal artery, after six months rest and low diet, seconded by the application of ice-water; but events of this nature are extremely rare.*

From all we have said, it results, 1st. That it is doubtful if the method of Valsalva can be employed, with any hope of success, in internal aneurisms, though recent and small; 2d. That when these aneurisms have acquired size enough to show themselves outwardly, we must always pursue a palliative treatment, without carrying it too far; 3d. That the method in question, seconded by the application of very cold water, or pounded ice, may be employed, with hopes of success, in certain external aneurisms; and, finally, That this method, and the other means of which we have spoken, ought to be tried in aneurisms whose size and situation will not permit an operation.

The only true curative means of the external aneurism, of which the efficacy is demonstrated, are compression and the ligature of the affected artery. Compression of the vessel affected with aneurism, has been practised, 1st. Above the aneurismal tumour; 2d. On the tumour itself; 3d. And it has lately been proposed and practised below the aneurism. But on whatever part the compression is placed, so that it can be practised with any hope of success, it is necessary, 1st. That the affected artery be not too deeply situated; 2d. That it have a solid and invariable resting

* See note M.

point of support upon an adjacent bone ; 3d. That the compression act only on the place occupied by the affected vessel, and on the point diametrically opposite ; 4th. That the artery on which the compression is to be exercised, furnish, above the point to be compressed, a sufficient number of large collateral branches, to keep up the circulation and supply the principal trunk ; 5th. That this artery be compressible, independently of the principal venous trunks of the member, so as not to prevent the return of the blood, which would occasion a considerable swelling, that would oblige us to discontinue it. But, under the most favourable circumstances, compression is far from being always exempt from inconvenience : on the one hand, it is very difficult to compress the vessel with sufficient force, exactness, and constancy, to keep the sides together, and prevent the passage of the blood, without, at the same time, causing some irritation of the integuments, violent pain, ulceration, and even mortification, particularly in women who have fine and delicate skins ; so that, after a short space of time, the compression is necessarily suspended, and sometimes even entirely discontinued. On the other hand, whatever care be taken in the application of the apparatus, it is impossible to prevent it from incommoding, more or less, the circulation in the veins ; and it will, particularly in the commencement, occasion edema in all the inferior part of the limb, and this may render the compression impracticable.

In exercising compression on an artery above the place where the aneurismal tumour is found, it is proposed not only to intercept the course of the blood, and prevent it from arriving in the aneurism, but also to produce adhesion of the sides of the artery, and its obliteration in the compressed point. It is easy to conceive how very doubtful the result of this last method of compression must be ; for, to obtain the adhesion of the coats of the artery, it is necessary that compression be constantly exercised at the proper point, so as not only to prevent entirely the passage of the blood, but to cause an inflammation in the sides of the artery. Now, such a degree of compression soon becomes insupportable, and we are obliged to renounce this means, before it has produced, in the arterial tunics, the degree of inflammation necessary to their union. It is probable, then, that compression above the tumour effects the cure of aneurism, not by bringing about the adhesion of the partitions of the artery in the place itself where it acts, but by preventing the blood from entering the sac of the aneurism with force sufficient to pass through it, and to keep in a

state of fluidity that which it contains ; and, by favouring the coagulation, it thus causes the obliteration of the artery in the part where it is affected. All these effects are simple, and easy to be comprehended. The blood contained in the sac of the aneurism, when once coagulated, loses gradually its volume by absorption, and becomes hard ; at the same time the sides of the cyst contract, and are almost confounded with the coagulum, so that the aneurismal tumour is converted into a kind of hard and consistent knot, which gradually diminishes. The obliteration of the artery is not confined to the tumour, but extends more or less above and below it ; it is difficult to say if it proceed inclusively, and without interruption, quite to the point of compression ; I know not if this fact have been ascertained on the body of a person cured of aneurism by this method. If we may judge by analogy, this continued obliteration of the artery, from the aneurismal tumour quite to the compressed point above, is neither the inevitable effect of the compression, nor a necessary circumstance to the cure, since, as we shall afterwards observe, the cavity of the artery has been found preserved between the place where the aneurism had existed, and that to which the ligature had been applied. This has been observed on subjects who have died after a successful operation by Anel's method.

Compression of the aneurismal artery above the tumour, ought, we think, always to be used when the situation of the disease will permit, and the other circumstances are favourable to the employment of these means ; it is even admissible not only when aneurism is small and recent, and there are hopes of a radical cure, but also when the tumour has acquired a considerable size, and appears to allow of no hope of a cure but from an operation, provided always that last resource be not very urgently called for. In the first case, a complete cure of the aneurism may sometimes be obtained ; in the second case, if the advanced state of the disease do not permit us to hope for complete success, provided compression can be practised a month or more, should it be even incomplete, by diminishing the passage of the blood through the tumour, the quantity which passes through the collateral arteries will be augmented, and their dilatation, and the success of the operation, will thus be promoted.

There are examples of the radical cure of true external aneurism by compression on the tumour itself, but they are extremely rare. Among practitioners who have made use of these means, some have thought it proper not only to prevent the ulterior growth of the tumour, but to bring the

Dilated arterial coats towards the axis of the vessel, and to restore them the power they have lost ; but the absurdity of this opinion does not require to be demonstrated. Compression of the tumour does not efficaciously act in the cure of aneurism, otherwise than by obliterating the affected artery : but, to produce this obliteration, the compression must act differently, according as the aneurism is recent and small, or of long standing and large. In the first case, the blood preserves its fluidity, and freely circulates in the tumour ; or if it coagulate there, the clot it forms is soft, and of small size ; then the tumour is entirely reducible by compression, the sides of the arteries are put into immediate contact, and the obliteration can only take place by their adhering together. In the second case, when the aneurism contains a mass of coagula, if the compression be slight, it may push the whole tumour towards the injured vessel ; the retardation, or total suppression of the circulation, may augment the mass and hardness of the coagula, and a cure may take place in a manner nearly similar to that already described. If, on the contrary, the compression be strong, it may mash the mass of polypous concretions that fill the tumour : a great part of the compressing force is then almost entirely restricted to the skin, which consequently inflames and ulcerates, thus hastening the bursting of the aneurism. Hence it is easy to see, that this manner of making compression can seldom have the same success as that before described : this is also demonstrated by experience. It has been lately imagined, that compression of the artery below the tumour, might be useful in the treatment of aneurisms situated too near the trunk to be operated upon, such as those of the axillary artery, and the crural in the groin. This idea was suggested by what happens to the blood, when it is arrested in a tied or compressed vessel. It is known that this liquid, when kept at rest, coagulates, and the vessel is obliterated above and below the place tied or compressed, to the next collateral branches of a certain size ; it was therefore imagined, that by compressing the affected artery below the tumour, the coagulation of the blood it contained, and the obliteration of a portion of the vessel would result ; but experience has not justified this reasoning. In those cases in which compression has been tried, it was promptly followed by an increase of the size and pulsations of the tumour, and was therefore renounced.

Finally, compression has been practised by means of a bandage over the whole member, such as is generally employed in cases of edema. It was proposed, by this means,

to dissipate the lymphatic swelling of the limb, which sometimes accompanies aneurism, to resist the lateral impetus of the blood into the tumour, and to favour its coagulation; but this sort of compression, employed with success by Thiden, in a varicose aneurism, does not answer in true external aneurism.

From all we have said of compression, considered as curative means in external aneurism, it results, 1st. That compression of the artery above the aneurism, ought always to be attempted when the tumour is of moderate size; but the use of it must be continued a long time, to answer the proposed object; that it ought to be employed in cases where no resource remains but the operation, because it renders success more probable, provided the case admit of delay. 2d. That compression of the tumour itself has sometimes been successful; but it does not merit a preference over the preceding mode. 3d. That, where it has been made below the tumour, it has appeared rather to aggravate the disease than to cure it. 4th. That compression, exercised by means of expulsive bandages, can be of no use in true aneurism. 5th. Finally, that all compression, exercised with a view of curing aneurism, ought to be seconded by repose, a proper regimen, and by local applications the most proper to favour its effect.

It is useless to describe the different bandages, or mechanical means, proper to cause compression. On this subject Guattani, Arnaud, Heister, Scultet, &c. may be consulted. We shall indicate, in a general manner, the principal conditions which these means ought to unite.

All means proper to compress an artery above the aneurism, ought to act directly on the vessel, and confine its action to that part. The compression ought to extend over a sufficient length of the artery, so as not to expose the skin to inflammation and mortification, which sometimes happens when it is confined to too small an extent; neither ought it to be carried over too great a space, that it may obliterate as few as possible of the communicating branches. The instrument for making compression ought to be so constructed, that its action may be graduated at pleasure, in order to give time to the soft parts to become accustomed to the pressure they suffer. Finally, without incommoding the circulation of the member, the compression ought to act with sufficient force to prevent the entrance of the blood into the tumour, and the machine must be so constructed and applied as not to be displaced by the various movements of the parts.

Ligature of the artery affected by aneurism, is the most

efficacious means that can be employed in the cure of this disease; it is also that which is most generally preferred at the present day. The progress of surgery has greatly improved in this respect, within thirty or forty years; at present, we do not hesitate to uncover an artery, and apply a ligature, whenever it is necessary or practicable; recourse to this means ought to be had when compression is inadmissible, or has been attempted without success, provided the aneurismal tumour be not placed too near the trunk, and the course of the blood can be suspended by compressing the vessel above the aneurism.

There are two methods of operating for aneurism, or of making the ligature of the artery to cure this disease; namely, the ancient or ordinary, that consists in opening the tumour, and tying the artery above or below; and the method of Anel, also called Hunter's method, in which the artery is tied above the tumour, which is left untouched. A third method has also been proposed and practised, which consists in tying the artery below the tumour, without opening it. But it may be foreseen, from what has been said of compression made below the tumour, what must be the result of this operation. We shall successively examine each of those methods.

In the operation for aneurism, according to the ancient method, the tumour is opened, and cleared of blood and coagula; the artery is then tied above and below the diseased part. This operation is that which appears to us to be most frequently proper, but it necessarily supposes the possibility of suspending entirely, and at will, the course of the blood, by compressing the artery above the tumour.

Before commencing this operation it is necessary to prepare the apparatus, which is composed of a tourniquet, one, or several straight bistouries, a grooved director, a female catheter, or a large stylet; three or four crooked needles uniting the conditions spoken of in the article on general operations, and more or less large, according to the size of the affected artery. Each needle is to be threaded with several threads, waxed and placed parallel, in form of a ribbon. These ligatures must be recently prepared, and sufficiently waxed, so as not to slip in the interval between the first and second knots; besides which, other threads of different sizes, a dissecting forceps, fine sponges, lint compresses, and a bandage, are necessary.

The patient being placed on a table furnished with a mat-rass, or on a bed high enough for the surgeon to act commodiously without being obliged to stoop, the first thing to be

done is to make ourselves masters of the blood, by placing a tourniquet on the principal artery of the affected limb, or by compressing this artery by an assistant, or, what is better, by both these means when possible. We shall hereafter indicate the places where the principal arteries of the limbs can be compressed, so as to suspend the course of the blood during an operation, and the different modes of making compression.

The course of the blood being entirely suspended, (which is known by the cessation of pulsation in the tumour,) the limb is to be placed in a commodious situation, and held by the assistants; then, with a bistouri held as if to cut from without inwards, a longitudinal incision is made through the skin that covers the tumour. The direction and extent of this incision are two important objects, which merit the greatest attention. Its direction ought always to be the same as that of the affected artery, whatever may be the form and situation of the tumour. If any other direction be given to the incision, the artery will not be uncovered, and it will be difficult to tie it; it will also be necessary to cut across the lip of the incision, under which the vessel will be hid: it may even happen, notwithstanding this, that the ligature may be placed by the side of the artery, which would be still more unfortunate.

The incision ought to be prolonged two or three inches above and below the tumour. There can be no injury in giving a great extent to this incision, and great difficulty would arise from making it too small. Surgeons who, from fear or improper regard for the patient, are apprehensive of making this incision of the skin too large, are frequently embarrassed when they come to apply the ligature; we have, in fact, observed, that the greatest difficulty in the operation for aneurism principally arises from the external incision being too small.

After the incision of the teguments, instead of cutting, one after the other, the cellular sheaths which compose the sac of the aneurism, with an improper circuminspection, that prolongs the operation, the bistouri ought to be plunged into the tumour, and make an opening in its middle large enough to admit the fore-finger of the left hand. This finger being introduced into the opening, will serve as a conductor to divide the tumour from one end to the other, by two successive strokes of the bistouri. As soon as the point of the instrument has penetrated the tumour, the liquid and florid blood it contains will escape per saltum, which would occasion some inquietude were not its effusion soon to cease; and if,

beside, you were not certain of the artery's being completely compressed.

The sac of the aneurism being open, it is then completely cleared of the coagula and liquid blood; and, to do this the more exactly, the interior of the sac is washed with a sponge. If some of the coagula, however, adhere too firmly to be thus removed, they are left to be detached afterwards by suppuration. This being done, the bottom of the cavity is attentively examined, and a yellow point is soon distinguished, which indicates the side of the artery opposite that which is injured, and consequently the place of its opening. If any difficulty be experienced, it can be immediately remedied, by removing the compression for a moment, and attentively observing the place from whence the blood issues. When the aperture in the artery is well seen, we are then to proceed to the application of ligatures, in the following manner: introduce into the aperture a female catheter, if it be the crural, popliteal, or brachial artery—a large stylet, if the radial or cubital. This instrument ought to be directed towards the superior parts of the vessel. We shall know when it has reached the cavity, by the facility with which it may be made to penetrate further forward. Alexander Monro, and those who, after him, have advised the introduction of a sound or stylet in the artery, have used this instrument with the intention of raising the vessel, and detaching it from the neighbouring parts, so as to be able more certainly to embrace it with the ligature, without, at the same time, including the nerves that ordinarily accompany the large arteries of the extremities. But most frequently the adherence of the artery to the adjacent parts has become so close, that it is impossible to raise and isolate it in this manner; and if sufficient force were employed to accomplish it, there would be great risk of tearing the vessel. We make use of the sound with another view; its hardness and form enable us to reconnoiter the position and direction of the artery, and furnish the means of seizing it with exactness between the fingers, without displacing it, and more surely including it in the ligature, without danger of piercing it with the needle, which would be more unfortunate than to miss it. As soon as the sound is introduced into the cavity of the artery, the end is confided to an assistant, who is charged to hold it firmly, without raising it. The artery is then pinched on the sound with the thumb and fore-finger of the left hand, which should be entered far enough into the bottom of the sac to extend, if possible, beyond the deepest part of the vessel; we are then to take

a curved needle, proportioned in size to the caliber of the affected artery, and threaded with a large ligature, such as has been described. A narrow round ligature would cut the artery before its entire obliteration.* The ligature must be long enough to form two equal ends, which, separated by a section near the needle, may be conveniently knotted and drawn close. The needle must be held in the right hand, the fore and middle fingers resting on the needle's convexity, and the thumb placed in its concavity; the surgeon is then to slide its point on the nail of the fore-finger of the left hand, and stick it perpendicularly into the cellular tissue; and after having carried it to a proper depth, pass it under the artery, and bring it out on the opposite side on the nail of the thumb. In this manner the vessel is safely comprised in the ligature with a certain quantity of the cellular tissue. When the thread has been sufficiently drawn, and cut near the needle, the surgeon withdraws the catheter, carrying the fore-finger of the left hand on the artery, at the same time seizing with the right the ends of the ligature, which are to be twisted in contrary directions. The compression being removed, if the blood do not flow, it is a proof the ligatures are properly placed; then the sound is again introduced, and the artery pinched with it as before. We should pass, in the same manner, a second double ligature five or six lines above the first, and comprising a greater quantity of the soft parts with the vessel; by which means this ligature, which is called that of reserve, is placed at a greater depth. This is an important precaution, for without it this ligature might occasion a consecutive hemorrhagy, because it cuts the parts it embraces, without even being drawn tight: we are then to take one of the parts of the first double ligature, that is to say, the inferior; separate it with care from the other part, and make on the bare artery a first simple knot, pressed hard by drawing the thread transversely on the extremities of the thumb, which must be introduced deep into the wound. When it is judged the knot is close enough, the compression is suspended; and if the blood do not appear, the first knot is confined by making another: this done, the sound is introduced into the inferior end of the artery, and a double ligature applied to it in the same manner. The small arteries that may have been divided in the course of the operation may then be secured; it is much better, however, to tie them as they are opened.

The manner of tightening the ligatures by simple knots,

* See note N.

such as we have advised, is preferable to using the surgeon's knot, which is recommended by several surgeons. This knot has the inconvenience of being tightened with difficulty, and it does not completely efface the cavity of the artery, even though great force be employed in tightening it; its inconvenience is proved by the following case: Chopart operated on a gardener for an aneurism of the popliteal artery, in presence of the most distinguished professors of the Ancient School of Surgery. The ligatures being placed, and the first being tightened by the surgeon's knot, the compression was suppressed, but the blood flowed abundantly; a second and third ligatures were placed and tightened in the same manner, and with as little success; after a moment's deliberation, the accident was attributed to the ossification of the artery, or some other unknown cause, and it was decided to amputate. On examining the limb, the artery was found in its natural state; it was embraced by the three ligatures; but although these ligatures had been tightened in the most forcible manner, neither of them had perfectly effaced the cavity of the vessel, but so incompletely, that a large stylet could easily penetrate it. This fact is sufficient to proscribe forever the surgeon's knot in the operation for aneurism.

It is recommended by some, to place between the ligature and the artery a piece of agaric, a roll of lint or linen, and particularly metallic plates; but this can be of no advantage, and may be injurious, in as much as a flattened artery never consolidates so soon as one that is pressed in a circular form. It is evident, that so much of the artery only will be divided as is next to the ligature. The other part is protected by the interposing body, and if the tunics of the artery be in an unnatural state, and have not mutually adhered, there is then more danger of consecutive hemorrhagy. Nevertheless, in some very rare cases, where the rigidity of the coats of the artery would be an obstacle to their bending, and prevent them being kept in contact by the round ligature, the artery-press, invented by M. Deschamps, may be beneficially used.

The number of ligatures in use may be considered too great, and, in fact, there are always four in reserve, three superior and one inferior; but on reflecting that the consecutive hemorrhagy is the most frequent and fearful accident that can happen after an operation for aneurism, and that it may take place either by the slipping of the first ligature, from its not being drawn tight enough at first, or because the artery may have been divided before it had time to obliterate, it will be seen that the number of ligatures

is not too great; and if the hemorrhagy that happens at the superior end of the artery depend on the first cause, by tightening the second part of the first ligature, the blood may be stopped; but if this liquid escape by an opening of the vessel, that the first ligature has divided, before its obliteration, the second thread being placed in that division, can be of no use; then one of the parts of the superior ligature of reserve is a precious resource; and there remains another which may be useful in its turn, in case the first ligature of reserve slip too soon. Without doubt, most frequently the greatest number, or even the whole of these ligatures, are useless. But if the precautions should prevent hemorrhagy only once in twenty operations for aneurism, it is sufficient to consecrate a practice called for by prudence; and it would be inexcusable to neglect it, at the risk of an effusion of blood, with which you may at any instant be surprised, and which may become mortal in a short time; besides, these threads remaining, have no other inconvenience than keeping up suppuration while there; and this inconvenience may be reduced to almost nothing, by taking the precaution to remove them, when the suppuration is well established, and the time has elapsed when hemorrhagy is to be feared. Placing the ligature on the inferior end of the artery, ought never to be omitted, although many have regarded it as useless; experience has demonstrated that the patients on whom this ligature has not been placed, are exposed to primitive and consecutive hemorrhages, which may become fatal.

It has been advised to prevent the hemorrhagy from the lower part of the artery, by compressing it below the place where it is torn; but compression, which is always less sure than the ligature, has the great inconvenience of impeding the circulation in the collateral arteries, and preventing the return of the blood and lymph, by the veins and lymphatics, thus producing mortification of the member.

Can the artery and the principal nervous cords of a limb be comprised without danger in the same ligature? The solution of this question is the more interesting, as sometimes the extent and progress of the aneurismal tumour so alter the structure or form of the adjacent nerves, that it is impossible to distinguish them; or the nervous trunk becomes so adherent to the tumour or the vessel, that it is very difficult to separate them, if they can be distinguished. Thierry, a doctor of Paris, has made experiments, from which it results, that, without inconvenience, the principal artery of the member may be tied with the neighbouring

nerves in living dogs. But it is not the same with man; observation has taught, that every time we comprise the artery, and all, or almost all, the nervous trunks of a member, in the same ligature, the brachial plexus, for example, or the sciatic nerve, gangrene never fails to appear in a few days: it is, however, proved by example, that the artery, and one of the principal nervous cords, may be fastened together without great inconvenience; nevertheless, we think it better to avoid it as much as possible, were it only on account of the violent pain that must necessarily result from the constriction.

Several authors, and particularly Bertrandi, have advised a method of operating very different from that we have just described. It consists in cutting the skin that covers the tumour, and dissecting it off; then tying the artery above and below, and opening the sac of the aneurism, of which the greatest part is removed, after having cleared it of the blood it contained. The inconvenience of this process is evident, and it is, at the present time, totally abandoned.

The second method of practising the operation of aneurism, is known under the name of the *new method*, or the method of Anel, or of Hunter. Anel says, that, being at Rome on the 30th January, 1710, he performed this operation for aneurism in the fold of the arm, on a missionary of the Levant, in presence of Lancisi and several other professional persons. The aneurism had been caused by bleeding. Anel performed the operation in the following manner:—The course of the blood being suspended by means of a tourniquet, he cut the integuments on the passage of the brachial artery below the seat of the aneurism, without touching the tumour in any manner; searched for the artery, and separated it from the adjacent parts, particularly the median nerve; and having raised it by means of a hook, tied it as near the tumour as possible. The tourniquet was then slackened. A small muscular branch, which had been cut in dissecting the artery, giving a little blood, the tourniquet was again tightened, and he once more tied the artery a little higher: the tourniquet being taken off, there was no more hemorrhagy or pulsation in the tumour. The patient was put on a low diet, and bled three times. The day after the operation, he was without fever, and the beating of the artery was distinctly felt at the wrist. The first ligature came away on the 17th February, and the second on the 27th of the same month, without the smallest degree of hemorrhagy appearing. On the 5th March, the sore was cicatrized, and the man had the perfect use of his arm.

The tumour disappeared by degrees, so that it was impossible, after the cure, to discover where the aneurism had existed.

It would be improper to confound, as some authors have done, this method of operating with that which has improperly been attributed to Guilleman, since it has been described by the most ancient authors, such as Aetius, Paulus Ægineta, &c. This consists in tying the artery above the tumour, and then opening it, clearing it of the blood it contains, and filling the cavity with such medicine as was judged proper.

Molinelli, in the second volume of *Memoirs of the Institute of Bologna*, has recalled the lost observation of Anel, in a large collection of observations on fistula lachrymalis; but he speaks of it only to blame its author. According to him, the collateral vessels that open into the sac of the aneurism, by pouring blood into it, would keep up or re-produce the disease. The example given by Anel, of tying the artery above the tumour, without touching this last, was lost for practice, until the month of June, 1785. At that period, Dessault, at Paris, undertook the cure of an aneurism of the popliteal artery after this method; and, with the intention of preserving the greatest possible number of communications, he laid bare the artery immediately 'above the tumour, and tied it at the most elevated point of the ham. The aneurism at first diminished very much, but opened on the nineteenth day, and gave issue to pus and blood; the orifice remained fistulous, and the patient died eight months afterwards, in consequence of a caries of the tibia. In the month of October, 1785, Hunter, of London, tied the femoral artery in the middle of the thigh, for an aneurism of the popliteal artery; he placed four ligatures around the vessel, the three superior of which were incompletely tightened, and the inferior one alone was drawn so firmly as to intercept entirely the course of the blood; he closed the wound immediately; the cure was very slow, and was interrupted by hemorrhage, which was stopped by means of a tourniquet, and several consecutive ulcers caused the ligatures to remain attached a long time.

During the life of Hunter, and since his death, this operation has been practised, with various success, in England, France, and Italy. In France, Chopart operated on a patient at the hospital of the College of Surgery: gangrene appeared, and although it was confined to the middle of the leg, the patient died. Desault practised a second time this operation, following exactly the method of Hunter, but

without success. It has been lately performed by Brasdor, Pellentan, &c. but generally without success. Mirault, of Angers, operated in this manner for a false consecutive aneurism of the brachial artery, and the patient was perfectly cured.

Of three operations by M. Deschamps, at the hospital Charité, for aneurism of the popliteal artery, one was cured without accident; there remained only a hard tumour, scarcely perceptible. A second was cured, after having lost two toes by the gangrene; and a third died, by a purulent infiltration of the whole limb.

The operation for aneurism, according to the method of Anel, is simple, and easy of execution. If the aneurism be on the popliteal artery, for example, after having suspended the course of the blood, the crural artery at the internal middle part of the thigh, is uncovered by an incision of the integuments and the fascia lata, parallel to the course of that artery, and of three inches extent. If the incision be made above the middle of the thigh, the artery is sought for by the internal side of the sartorius muscle, and by its external side, if the incision be made lower down; but if the incision correspond to the place where the artery is covered by the muscle, the vessel ought to be cleared from under it, or the muscle may be cut across, by means of a grooved director placed between it and the artery. This section, which I have seen practised by Desault, can have no inconvenience, as experience has proved; for although it is certain the muscular fibres cut across never unite, but by the means of a cellular ligamentous substance intersection, it is not less true, the transverse division of a long muscle does not sensibly injure its power of contraction. The artery being uncovered, one or several ligatures are applied; one of them is drawn tight. The wound may be united immediately, or by granulation: this last is preferable, if we consider the accidents Hunter himself experienced, and which is reasonable in part to attribute to the healing of the wound. Ligatures that act in a gradual manner on the artery, as those placed by Hunter in his first operation, would have the inconvenience of cutting the vessel without producing its obliteration, and thus endanger a consecutive hemorrhage.

As soon as the artery is tied, the pulsations of the tumour entirely cease; it sinks and diminishes daily; sometimes it disappears so completely, that it is difficult to trace the smallest vestige of it; at other times, it remains in the form of a nut, hard and more or less voluminous, but always exempt from pulsation. On examination of the limb some-

time after a cure obtained by this method, the artery will be occasionally found obliterated from the point where it was tied quite below the tumour; sometimes obliterated in the place of the ligature, and filled with a hard adherent coagulum, or even obliterated in the place of the tumour, but preserving its cavity in the intermediate points. The first subject operated on by Hunter, dying of a fever a year after the operation, they found, on examination after death, the femoral artery obliterated, from the origin of the profunda quite to the spot where the ligature had been placed; there it was cartilaginous, and partly bony, to the extent of an inch and a half. Below this part, its caliber was preserved quite to its entry into the tumour, which was reduced to the size of a small hen's egg: it was filled with a very hard coagulum adhering to its internal surface.

On examination of the body of the subject operated on by Chopart, and which, we observed, died with gangrene, the artery was found obliterated the extent of several inches below the ligature; but, as in the preceding case, it resumed its natural diameter immediately below the tumour, and the articular arteries opened into the tumour itself. If this operation had been followed by a more fortunate issue, could the articular arteries throw the blood into the aneurism? and was this sufficient to justify the doubts of Molinelli?

We have seen at the hospital Charité, on the body of a subject who had been operated upon for an aneurism in the popliteal artery, eight years previous, by Anel's method, the femoral artery obliterated for an extent of two inches, in the spot where the ligature had been placed; below this obliteration, the artery had preserved its ordinary diameter, and received the blood by two large and short trunks, that communicated above, one with a branch of the femoral, the origin of which was above the obliteration; the other with one of the perforantes, or rather with the profunda itself and a branch of the external circumflex. Towards the lower part, these trunks communicated with the articular arteries; so that the blood came to the femoral, between the obliteration which the ligature had produced and the tumour, and from thence passed towards the articular branches, and those of the popliteal artery. Nevertheless, the tumour, situated immediately above the condyles of the femur, was reduced to the size of a small olive, and appeared to be changed to a ligamentous substance without a cavity. The obliteration of the popliteal artery in this part, occupied an extent of nineteen lines.

From what we have said, it will be seen that the method of Auel, called that of Hunter, has a number of successful cases to support it; but they are not numerous enough to give it a preference over the ancient method.

The success I have obtained from this last mode of operating, the difficulties and inconveniences of which were exaggerated, have led me to abandon Auel's method, which, besides, does not appear to unite all the advantages attributed to it. Besides, were I to practise it, after having uncovered the artery in the most favourable part, I should open it longitudinally, to a sufficient extent to be able to introduce a female catheter; I should then place two double superior ligatures four or five lines distant from one another, and a double inferior ligature; in a word, I should conduct, in all that has relation to the number of ligatures, the manner of placing them, and of tightening them, in the manner I have already described, in speaking of the ordinary or ancient method.

Finally, some years since, the ligature of the artery below the aneurism was attempted; but experience soon pointed out all its dangers.

A long time since, this operation was proposed by Brasdor, Professor of the Ancient School of Surgery. Desault, in his Lectures on Pathology and Operations, usually asked the question, Whether it did not offer some hopes of success, when the situation of the aneurism rendered an operation impossible by the ordinary method? But this celebrated practitioner never attempted to solve his problem by experience, when opportunity offered: I knew of no attempt to this effect, until I was apprised by M. Vernet, formerly chief Surgeon of the Armies, that he had tried compression of the femoral artery below an aneurism, situated on the superior part of the thigh; but that the tumour having rapidly grown, and the beatings become much stronger, he was forced to abandon these means, and confine himself to a palliative treatment.

I still entertained these simple notions, when there was presented, at the hospital Charité, a man of sixty years of age, having, in the superior part of the thigh, an aneurism nearly seventeen inches in circumference, that extended quite to the bend of the groin, and within the thickness of a finger of the crural arch. M. Deschamps assembled nine consulting surgeons, and proposed tying the artery below the tumour, hoping that the stagnation of the blood would occasion its coagulation in the tumour, and gradually upwards in the artery above, quite to the commencement of the pro-

funda femoris; he particularly insisted on the difficulty of firmly compressing the artery above the tumour during the operation, and that of sufficiently extending the incision towards the top, to place the ligature between two so important vessels as the superficial femoral and profunda. In the discussion, I combated the proposed operation by argument, and by stating the useless attempts of M. Vernet; I maintained the possibility of operating according to the ordinary method, founded on the small extent of the injury of the artery, notwithstanding the size of the tumour, and the probable situation of the opening of the vessel a sufficient distance from the crural arch, and even from the arteria profunda. The votes were taken, and seven in ten were for the ligature below the tumour. The operation was performed, but it was long and painful; the situation of the artery was a long time undecided, as its pulsations could never be distinguished. The progress of the tumour had been very sensible immediately before the operation, but it was such afterwards, that, on the fourth day, the rupture appeared near at hand. It was then decided to perform another operation, notwithstanding all the considerations that had at first prevented it. The compression was exercised against the pubis by means of a pad with a handle. After the opening of the sac, two ligatures were placed above the opening of the artery, and one below; but, during the operation, the hemorrhagy was considerable, and the patient expired eight days after. On opening the body, it was found that the origin of the profunda was situated two lines only from the crural arch, and that the ligature of reserve had been placed exactly between that artery and the femoral, which clearly proved that the operation, according to the ordinary method, could, at first, have been performed with the greatest probability of success.

We see, by this case, which was published with the greatest details by M. Deschamps, the evils of this method of operating. The result of this experiment accords with that of using compression below the tumour; both together lead us to conclude, that, as preventing the circulation of the blood above the tumour, in an artery affected with aneurism, is the only method by which the disease can be cured, so, means of the same nature, employed on the artery below the tumour, accelerate its progress, and hasten the fatal termination of the disease.

After an operation for aneurism is performed, the ligatures ought to be ranged on the lips of the wound, so that we may know, by some distinctive mark, those that are

fight from those that are not so ; we are then to cover the wound with soft lint, supported by a short bandage, taking the greatest care not to load the member with heavy dressings, and not to tighten the bandage any more than is necessary to keep them in place. This last precaution is of the greatest importance, because the pressure exercised by the bandage will incommode the circulation in the capillary system of the member, and thus deprive it of a resource so much the greater for this function, as the anastomoses are excessively multiplied in the capillary tissue.

The dressings being applied, the limb should be placed in a situation to favour the circulation, and particularly the return of the blood and the lymph. To keep up a proper temperature, it should be surrounded by small bags half filled with fine sand or sifted ashes, properly heated, and frequently renewed ; but it ought not to be covered with them, as their weight might act as a compressing force ; it will be sufficient to cover it with warm linen, which must be frequently renewed.* This is preferable to the application of bladders filled with a warm liquid, because the sand not only preserves its heat, but absorbs the humidity of the perspiration ; it is particularly preferable to the use of spirituous fomentations, which, quickly cooling, require to be too frequently renewed, and excite, in the capillary vessels, a contraction contrary to the proposed end. Observation has taught, that, after an operation for aneurism, sometimes the natural heat is preserved without any alteration, and the pulse does not cease to be felt in the arteries accessible to the touch below the ligature, which leaves no doubt as to the circulation, and renders the success of the operation very probable ; at other times, the temperature of the limb at first diminishes, and the pulsations in the inferior arteries totally disappear ; but, at the end of a few days, the heat is restored, and sometimes even surpasses the general temperature of the body, during the process of suppuration ; afterwards the pulsations of the remote arteries are re-established ; at first, like an almost imperceptible pricking on the skin, but very gradually the pulsations become more distinct. Sometimes, during the absence of the pulse, and the diminution of the temperature of the member, mortification destroys a portion of the integuments, or some of the toes ; sometimes the gangrene affects the whole limb ; at times it is arrested at a greater or less

* See note O.

distance from the trunk ; at others, it rapidly extends, and leaves no hope even from amputation.

Generally, before the completion of the cure, some hemorrhagy occurs ; the ligatures of reserve then become necessary ; but, to point out the use that may be made of them, it will be well to offer some considerations on the causes of this accident.

All consecutive hemorrhagy, after the operation for aneurism, depends, as we have already said, upon the ligature's having been drawn too tightly, or not tightly enough, or upon a diseased state of the artery. The ligature produces the double effect of intercepting the course of the blood in the artery, by keeping its sides in contact, and of causing them to adhere, by the inflammation it excites at the same time it cuts them. It is then easy to conceive, that, if the constriction of the ligature be too great, on the one hand, the inflammation it excites in the coats of the artery surpasses the degree that would procure their adhesion ; on the other, it cuts the artery before adhesion has taken place, and before it can resist the impulse of the blood. In this case, the blood is poured out along the course of the ligature. It is then, however, very possible, if the ligature embrace at the same time a certain quantity of the cellular tissue, which is soon destroyed, that the compression will be reduced to the proper degree ; that the proper tunics of the vessel being cut by a ligature too tightly applied, the inflammation of the cellular tissue is sufficient to resist the momentum of the blood, and prevent hemorrhagy : were it not so, this accident would be more frequent. When, on the contrary, the ligature is not tight enough, it does not sufficiently close the sides of the vessel to put them in contact ; however, it ulcerates and divides them. In this case, if the operation be performed according to the ancient method, the hemorrhagy takes place sooner, and the blood escapes by the opening of the artery that answers to the bottom of the sac of the aneurism ; if the new method be followed, hemorrhagy occurs at a later period, and the blood flows through the passage made by the thread. Finally, an artery whose tissue is diseased, may have lost the necessary degree of consistence to support the constriction of a ligature, or not be susceptible of the inflammation necessary for its obliteration. From this observation may be seen all the importance of the ligatures of reserve, and the cases to which they are applicable. The use of inferior or superior ligatures is proper ; without this resource, the practice of compres-

sion would be necessary—a means always injurious, and necessarily followed by the gangrene of the limb, as experience has demonstrated. It would, without doubt, be much better never to give the ligature more than the necessary degree of tightness; but, on the one hand, it is almost impossible to reach this degree of perfection; on the other, the consistence of the partitions of the artery is too variable for a prudent practitioner not to be always in doubt as to the effects of a ligature.

The ligatures generally separate from the eighteenth to the twentieth day: if they hold after this time, they may be twisted every day, to accelerate their fall; or they may be cut with caution, and withdrawn.

The wound that results from the operation for aneurism, when once the suppuration is established and the ligatures fallen, becomes a simple sore, and ought to be treated according to the rules laid down in speaking of wounds in general.

SECTION II. *Of False Aneurisms.*

False aneurism is that which is formed by blood issuing from an open artery; whether the blood escape from the artery the very moment it is opened, and infiltrate into the cellular tissue; whether it do not escape, until a longer or shorter period after the wound, and then flow into a cavity, which it forms by removing the lamina of cellular tissue; or, lastly, whether it immediately pass from an artery to a vein, after a wound that has affected both of them: from whence the distinction of false aneurism into *primitive* or *diffuse*, into *consecutive* or *circumscribed*, and into *varicose*.

Of the Primitive False Aneurism.

When an artery has been opened by an external cause, and particularly by a sharp instrument, if the orifice be not parallel to that of the skin and the other divided parts, blood is poured out into the cellular tissue, and forms a false primitive aneurism, not circumscribed or diffuse.

The cause of this sort of aneurism, is an injury of an artery by any instrument. but most frequently by one that is sharp and pointed, such as a sword, a knife, or a hatchet, &c. The ancients considered this aneurism as the result of an unfortunate bleeding alone; and a great number of authors, among which may be mentioned Dionis, speak of

it only as one of the accidents that may accompany this operation. This cause is much less common at the present day, as bleeding is less frequent.

The false primitive aneurism is easily distinguished; it is always the consequence of a wound in a part where one or several arteries, of greater or less diameter, are found, and in which one of these arteries has been opened. The opening of the artery not being parallel with that of the integuments, or this last having been stopped up in the first moment, as generally happens, the blood ceases to flow externally; but it infiltrates, in a greater or less quantity, into the cellular tissue. The tumefaction extends principally along the passage of the injured vessel, and towards the least resisting points of the cellular substance; the tumour is vague, not circumscribed, and the colour of the blood that forms it, is visible through the skin, which becomes of a marble colour. The part of this tumour that corresponds with the aperture in the artery, has sometimes a slight tremulous pulsation; but it is doubtful whether the regular beatings that are always observable in true aneurism, can be distinguished; as to ourselves, we have never remarked this phenomenon in any of the primitive false aneurisms we have had occasion to examine. When the primitive false aneurism is considerable, it is accompanied by more or less pain, numbness, and coldness of the member.

By an attentive consideration of all these symptoms, it is so easy to know this disease, that, to mistake it must be attributed to a want of anatomical knowledge, or a very superficial examination of the case. The following are examples of errors of this kind:—

A labourer of Surine wounded himself with the point of a sickle, in the anterior and superior part of the leg; his handkerchief was bound round the limb, and stopped the hemorrhagy; shortly after it became considerably swollen, and the whole member presented a livid colour. A surgeon was called, who, making only a superficial examination, ordered the application of emollient poultices. The symptoms increased, the epidermis separated, and the man was transported to the hospital Charit', where Desault was then assistant surgeon. As soon as this celebrated practitioner was informed of the circumstances, he judged that the anterior tibial artery had been opened in its upper part; he did not hesitate to make the proper incisions; he laid bare the vessel, discovered its injury, and applied a ligature to it; after this, he cleared the cellular tissue of a great quantity of black grumous blood. The hemorrhagy was perfectly

arrested ; very extensive eschars separated ; but the patient being very old, sunk under a very abundant suppuration, the inevitable consequence of so great disorder.

Shortly after this, a young man from the country was wounded in the thigh by the fall of a knife that had several blades, which he was showing his companions ; the crural artery was opened, and the hemorrhagy was at first very considerable, but the blood being stopped by cramping lint into the wound, a prodigious swelling of all the member soon followed, which was taken for an inflammatory congestion. The patient was brought to the hospital ; Desault understood the case, and operated, but without success.

We saw, in 1791, a young man, twenty-five years old, who had been wounded by a knife in the middle superior internal part of the arm ; the instrument was directed from below upwards, along the biceps muscle, and opened the brachial artery under the brachialis externus. The patient at first lost much blood ; the hemorrhagy, however, ceased spontaneously. The surgeon that was called, treated the wound as a simple one, and did not perceive the importance of the accident until eight days afterwards ; it was then discovered by a return of the hemorrhagy, in consequence of an effort in coughing. The greatest part of the blood was infiltrated ; the member then became very large, and of a livid hue. It was necessary to perform the operation without delay, but it was unsuccessful.

A very important circumstance to be considered, because it may occasion similar mistakes, is the want of relation of the exterior wound with the artery, and sometimes the very oblique passage of the instrument, which may have reached the vessel in a place more or less distant from the part where it entered the skin. Thus we saw a miller, that was wounded in the anterior and external part of the thigh by a bill-hook ; the crural artery was opened above its passage across the triceps abductor. But, whatever may be the obliquity of the wound, an attentive examination of the phenomena that accompany it, will always preserve a careful and instructed surgeon from error.

False primitive aneurism is always a serious disease, and, if abandoned to itself, it never fails of having a fatal termination. The prognosis is more or less alarming, according to the diameter of the injured vessel, its greater or less distance from the trunk, and its depth.

False primitive aneurism is extremely dangerous, when it results from an injury of an artery of great diameter, and the opening of the vessel is large. In this case, the

blood flows abundantly from the wounded artery, infiltrates into the cellular tissue, and soon fills all the cavities; the limb rapidly acquires a great size; the extreme distension of all the soft parts, and the pressure which the extravasated blood exercises on the capillary system, and even on the arterial branches of a certain diameter, soon suspend the circulation, and produce gangrene. The danger is less, when the wounded artery is of small diameter; but the case is then serious, if that artery be deeply situated; as, for example, are the tibial arteries. This disease is almost absolutely mortal, when it depends on the injury of a principal artery, and the opening of that artery is so near the trunk, that it is impossible to compress it above the wound. In general, false primitive aneurism does not offer so great resources for the circulation in the affected member, after the obliteration of the principal trunk, as true aneurism, and even as that we shall speak of under the name of *false consecutive aneurism*. In this last, the impediment to the blood, in the course of the principal vessel, arising from the pressure of the tumour upon it, causes a certain degree of dilatation in the collateral vessels. This does not take place when an extravasation of blood follows a recent wound.

From what has been said, on treating of the hemorrhagy arising from wounds, it is demonstrated, that a wound of an artery can be cured only by its obliteration. The preference that was given, forty years since, to compression instead of ligature, to stop hemorrhagy produced by the injury of the large arteries, was founded on the opinion then entertained of the possibility of obtaining a perfect cure, and preserving the cavity of the artery; but, at this day, we are convinced the ligature is the surest means, and least subject to inconvenience, and, we may say, the only proper means of procuring a perfect cure, exempt from danger of the formation of false consecutive aneurism.

Nevertheless, the compression may be applicable to certain cases, where the opened artery is of a small diameter, has a support in a neighbouring bone, and is situated immediately under the skin: such are the arteries that lie on the exterior of the skull, the anterior tibial very low down, &c. Even in this case, attention is necessary not to make the compression immediately upon the aperture in the vessel, and in the interior of the wound; but externally, and at a considerable distance between the wound and the heart. In conducting otherwise, violent inflammation would perhaps be brought on. We have seen immediate compression, exercised on a wound where the anterior tibial artery was in-

terested, cause gangrene of all the integuments on the back of the foot; whilst, in analogous cases, we compressed, with success, the artery between the heart and the wound, which has been promptly cicatrized.

In making compression in similar cases, the point of the passage of the artery must first be forcibly pressed by the thumb, so as to remove the blood that may be infiltrated into the cellular tissue—depress the skin, and approximate it to the vessel; then, in the excavation that results from this pressure, we are to place a thick compress, and, over it, others, larger and larger, so as to represent a pyramid with the base upwards. This pyramid is kept in place by a bandage, not so tight as to incommode the circulation in the other vessels. The compression must be continued a long time, otherwise the cure is only temporary.

In all other cases, compression is absolutely useless, and even injurious; for, on the one hand, the apparatus cannot have sufficient stability not to be deranged every instant; on the other, it is impossible to make the compression so that the open vessel, and the point of the limb immediately opposite, should be the only parts on which it is exercised; and all that can be obtained from it, is the formation of a coagulum, more or less adherent to the lips of the aperture, and which is detached on the first occasion, and causes the formation of false consecutive aneurism.

At all times, therefore, when the wounded artery is of a certain diameter, compression cannot be calculated on as a means of cure; the ligature cannot then be dispensed with, even should the open artery be near a bone that would afford it a solid resting-place. Thus, in false primitive aneurism of the crural artery, of the popliteal, the brachial, the radial, the cubital, the anterior tibial in its three superior quarters, the posterior tibial, and of the fibular, the ligature ought always to be preferred to compression.

The rules concerning this operation being the same as those mentioned in treating of true aneurism, we shall only add some reflections relative to this case in particular.

When the wound of the integuments is directly in the passage of the artery, and the instrument has acted perpendicular to the vessel, it is only necessary to cut down to it, and enlarge the wound to a proper extent; but always when the external wound is at a distance from the passage of the artery, and the instrument has taken an oblique direction to reach it, no attention ought to be paid to the wound of the integuments; for, in following its passage to the artery, many parts are necessarily divided. The vessel must be

laid bare only in a small extent; you need not fear, however, making too large an external wound, but cut on, to ascertain to what height the artery is injured; insert a large round-pointed probe, and enter it as far as possible into the wound; mark the depth it has penetrated, and then lay the probe on the outside of the limb in the same direction, and judge of the place where the artery is injured, by that which corresponds to the extremity of the instrument. This done, make an incision on the passage of the artery, so that the place that was judged would correspond to its aperture, answers to the middle of its length. The cellular tissue must next be cleared of the coagulated blood—the liquid part absorbed with a sponge; you must then uncover the artery, search for the opening, and afterwards tie the artery, in the manner pointed out in treating on true aneurism. The precepts laid down in that paragraph ought to be conformed to in all that concerns the subsequent part of the operation.

Of the False Consecutive Aneurism.

This name is used to designate a tumour formed by blood which has escaped from a wounded artery some time after the wound, and is contained in a bag, or sac, formed of the adjacent cellular tissue.

If a false consecutive aneurism be anatomically examined, after having separated the soft parts, that are always displaced, and compressed, as in true aneurism, a cyst will be discovered, the firm sides of which are formed by the lamina of cellular tissue, brought into contact, and adhering to each other. The cavity of this sac is filled by a coagulum of greater or less size, and of a density proportioned to the continuance of the disease, and sometimes more consistent than the muscular substance, as we have seen in an aneurism that had existed ten years. This coagulum has the appearance of a uniform mass, and not, as has been pretended, of layers of different consistency, and disposed in regular order. In this polypous mass is always seen a reservoir that contains fluid blood, communicating with the cavity of the artery: this reservoir generally occupies the centre of the tumour. The aneurismal sac being emptied, the opening of the artery may be seen; it is always round, whatever may have been the form of the instrument by which it was made: we have often seen it of a diameter that would admit the end of the little finger. Through this aperture the inside of the artery is distinguished, which is

of a yellowish colour. The artery sometimes corresponds to the bottom of the tumour, sometimes to one of its sides. This situation of the artery towards any particular point of the circumference of the aneurismal tumour, depends on the side of the artery that has been wounded ; for it is always displaced in an inverse direction. A man being wounded in the thigh by a dagger, the blade of which was very thin, the instrument entered by the external side, between the tendon of the biceps muscle and the femur, and opened the popliteal artery in the ham. The aneurism that followed, grew towards the external side, and the artery was pushed inwards, so that it was comprised in the thickness of the internal part of the sac of the aneurism. This circumstance merits great consideration, as it may very much shorten the labour of finding the artery during an operation.

When an artery of a certain diameter is opened, and the blood has been stopped by means of compression, the hemorrhagy is suspended by the formation of a small coagulum, which closes the opening ; the external wound is cicatrized, and the patient appears cured : but, after some time, (one or two weeks, months, or even a number of years.) the clot is detached by the lateral impetus of the blood. This liquid escapes, raises, and detaches the cellular covering of the artery, distends it by degrees, and forms the aneurismal sac, the density and thickness of which augment by the successive applications of the lamina of the adjacent cellular tissue. The stagnation of the blood in this aneurismal cavity occasions its coagulation, and the absorption of its liquid parts permits the approximation of its condensed and fibrous portion, which becomes adherent to the sides of the cyst.

It was imagined that the clot which at first stopped the aperture in the artery, being detached only in a point of its circumference, the blood ought, by penetrating into the cavity at several different times, to form distinct layers, of different density ; but, as we have already said, nothing of the sort is found, and the authors who have spoken of this disposition, have not agreed among themselves as to the arrangement of these layers, which proves that they have not spoken from actual observation.

False consecutive aneurism grows slower than true aneurism, particularly when this last has arrived at a certain size, and the proper tunics of the artery are already broken. In this last case, the opening of the artery, from the commencement, is large enough to admit a strong column of blood ; which does not take place in the first case, where

the aneurismal cellular sac is submitted to a much less powerful expansive force.

False consecutive aneurism appears in the form of a tumour more or less voluminous, circumscribed, and situated on the passage of an artery; small at first, and making but slow progress, accompanied by pulsations synchronous with those of the arteries: a cicatrix is always visible, either on the tumour itself, or near it. This tumour is not accompanied by pain, or change in the colour of the skin; it is diminished by pressure, when it is small; but, when chronic and large, it diminishes little, or not at all, from the same means: it has then, instead of a beating, an obscure tremulous motion.

It will be seen how similar the symptoms of this disease are to those of true aneurism; they differ only in the slowness of its progress, and the circumstance of its having succeeded a wound. It may also be added, that, at a certain epoch, the true aneurism acquires a more rapid development than it had before, and this depends on the rupture of the proper tunics of the artery. But, on the one hand, this phenomenon is not always distinct in true aneurism; on the other, some particular circumstances may produce it in false consecutive aneurism. A man received a wound on the anterior and inferior part of the leg; a considerable hemorrhagy followed, which was stopped by compression; the wound healed, and the man was apparently cured. But, soon after, there appeared a small pulsating tumour, which raised the cicatrix, and gradually increased. The person having received a blow on this tumour, it suddenly augmented in size, became painful, and ceased to pulsate. It will be seen that, in this case, commemorative circumstances alone could furnish the means of forming a diagnosis.

The prognosis of false consecutive aneurism is absolutely the same as that of true aneurism; as, in this last, the compression of the tumour on the principal trunk, and the dilatation of the collateral branches, which is the consequence of it, makes its age a favourable circumstance to the success of the treatment; and as false consecutive aneurism makes but slow progress, and may exist a long time without danger, it is perhaps proper not to undertake an operation until the disease has continued some time, or rather until the tumour has acquired a certain volume. It is to be remarked, that false consecutive aneurism may, for a long time, preserve a middling size; and afterwards, all at once, considerably increase. Saviard relates a case of aneurism of this sort in the bend of the arm, that had pre-

served the size of a walnut for twenty years, and afterwards was so considerably augmented, that the whole arm was greatly tumefied.

The obliteration of the artery in the place of the aneurism, and at a certain distance beyond it, is, in this case, as in all others of the same disease, the only condition on which a cure can be effected. To produce this obliteration, compression and ligature may be equally employed; and we refer to what has been already said of the comparative utility of these two means; we shall only observe, that, for the reasons we have advanced, the circumstance of a tumour's containing a considerable mass of coagulated blood, appears favourable to compression above the tumour—a means which, besides, may increase the probability of success from the operation, should it afterwards become necessary.

As to the operation, it ought to be performed in the same manner as in true aneurism. We shall only remark, that the ancient and the new method are here equally applicable, and that, except in some particular cases, which are difficult to determine, the first method ought to be preferred, because the artery being sound, and the opening of small extent, the ligatures can be placed at a small distance from each other, and not include any of the collateral branches. The external incision ought always to be made on the passage of the artery, and following its natural direction, whatever may otherwise be the situation of the cicatrix which indicates the seat of the wound that has occasioned the disease, and whatever may be the form of the tumour; and if the deviation of the artery cause any difficulty in discovering the opening, it may be easily known, by suspending the compression, and, if necessary, compressing the vessel in the bottom of the sac.

In both kinds of false aneurism, compression, applied immediately to the vessel, after having laid it bare by the proper incisions, has been proposed, and practised. The opinion once held, that compression would cure the disease without obliterating the vessel, could only have given credit to a process, of which experience has since demonstrated the inutilty, and even danger. This means can only favour the formation of a coagulum at the opening of the artery, or cause the mutual adhesion of its sides. Now this last effect is more certainly produced by the ligature, which is quite as easily applied when the artery is uncovered; and, acting in an isolated manner, it does not expose the member to the danger of mortification, that almost inevitably results

from compression, which acts not only on the artery, but on the whole circumference of the member, and consequently on the anastomosing branches, which it is important to leave at liberty.

The two kinds of false aneurism of which we have been speaking, depend on an injury of the artery by an external cause. But this disease is not always the consequence of a wound; numerous cases, collected by authors of credit, attest, that internal unknown causes may occasion the deposit, apparently calcareous, in the cellular tissue, that unites the internal and muscular tunics of the arteries; or the ulceration of the internal coat, and successively of the muscular; or, finally, the formation, on the sides of an artery, of tumours of a steatomatous, or rather of an atheromatous nature. It seems even that these three affections are somewhat analogous; and what was called an *earthy formation*,* differs from the true ossification of the arteries, as seen in aged persons; since there are sometimes found, on the internal surface of the same vessel, and almost in the same point, ulcerations and yellow spots; some of which are solid, and others containing pulpy matter, resembling melted tallow, which we have observed in a case, of which we shall give the history at the end of this article.

This diseased formation adheres to the internal surface of the arteries, and is united together only by the internal membrane, and has very little connection with the rest of the coats of the artery. It is evident the lateral impetus of the blood may easily destroy the feeble adhesion of this sort of scales, and that the natural consistence of the muscular tunic, which, in similar cases, is always diseased, being diminished, the blood may readily insinuate itself under the cellular coat, and thus form the aneurism which has been called *spontaneous*. The same effects, in a more rapid manner, take place after ulceration, where there is, at the same time, loss of substance, and a weakened state of the coats of the artery. When atheroma is developed in the thickness of the tunics of the vessel, one of the sides of the tumour, pushed towards the interior of the artery, diminishes its caliber; and this side being destroyed, either by the progress of the disease, or by circumstances relative to the circulation, the blood quickly gets under the cellular tunic, which it distends in the manner of a cyst. Finally, it may be conceived that, when any of these morbid predispositions exist, the sudden swelling of the muscles in any violent

* Scarpa, work already cited.

movement, may cause a rent in the artery, or even rupture it more or less completely. It is only thus that we can explain the sudden formation of certain aneurisms occasioned by violent efforts: for we cannot suppose the structure of the sanguineous vessels to be naturally so defective as to be exposed to be broken by a strain, without a morbid predisposition. In this manner only the loss of substance in the coats of the arteries, which has been observed on opening of certain aneurisms, can be explained.

Spontaneous aneurism is generally preceded by a vague pain in the member, and spasmodic contractions of the muscles; and if some effort do not occasion the sudden appearance of the aneurismal tumour, it successively augments in a more or less rapid manner.

It will be seen that, in this last case, the progress of the disease differs too little from true aneurism, to be characterized by any peculiar symptoms; and the only difference by which spontaneous aneurism can be distinguished from true, is that, in the first, there has been no wound that would affect the artery.

As to the prognosis and treatment of spontaneous aneurism, they differ so little from those of true aneurism, that we shall not dwell on the subject, but only remark, 1st. That, in spontaneous aneurism, the existence of the aneurismal diathesis is always to be feared. 2d. That we are never sure that the collateral arteries, on which hopes of success are founded, are in their natural state, or that they do not partake of the disease of the arterial trunk.

Of Varicose Aneurism.

The term *varicose aneurism*, *aneurism from anastomosis*, or *aneurismal varix*, designates a tumour formed by the blood of the arteries that has passed from an artery into a neighbouring vein, and has dilated it.

The exact knowledge of this disease is not very ancient; it was first described by William Hunter; after him, several celebrated practitioners, both in England and France, have observed it. It is, however, just to observe, as Scarpa has already done, that Sennert had described the principal characters of this disease, in giving the history of an example he had seen, but without knowing the nature of it; and that Guattini had published two similar cases, wherein he not only gave an exact and detailed description of the symptoms, such as they now are observed, but, by reflection alone, without dissection, he indicated the true

causes and mechanism of this particular sort of aneurism. "*Sanguis a foramine arteriæ prodiens,*" says he, "*per* "*venæ foramen intra basilicam se recta intulerit.*"

The causes of this disease, and the mechanism of its formation, are evident. When a vein, intimately united to an artery, is pierced through, and the artery is opened at the same time, as frequently happens, by the point of a lancet, in the operation of bleeding in the basilic or median vein, the blood at first flows externally, and with impetuosity, if the external opening be large enough: an hemorrhagy, difficult to stop, may be thus caused. But if, by compression, we become master of the blood, the external wound in the vein and integuments cicatrizes, while the opening common to the artery and the vein is preserved, and kept up by the passage of the blood from the first into the second of those vessels, and a direct communication is established between them for the remainder of life. The blood of the artery, in passing into the vein, presses it laterally, and in a short time renders it varicose, in a greater or less extent.

In thin spare subjects, the basilic or median vein is so united to the brachial artery, which it obliquely crosses, that it is almost impossible to open it in this point, without risking the opening of the artery at the same time. The bend of the arm is the only part where the varicose aneurism has hitherto been observed; it may, however, be conceived that this aneurism may appear in any other part where the same circumstances are united; that is to say, where an artery of certain dimensions lies over a vein. M. Larrey, a distinguished surgeon of Toulouse, saw a varicose aneurism in the ham, produced by the point of a sword, that had opened the vein and the popliteal artery. The pathological description was sent to the Royal Academy of Surgery, with the detailed history of the case, which was never published, but which may, no doubt, be found among the papers of that celebrated body.

The more or less intimate union of the vein and the artery, the communication of which occasions the varicose aneurism, causes important differences relative to the nature of the disease, its consequences, and treatment. In certain cases, the two vessels, brought into very close contact, are united together by a very thin layer of the cellular tissue, the slight inflammation of which produced by the wound, renders the union of the artery and the vein more intimate, and in a manner identifies their sides, at the borders of the common opening. In this case, the communication and the passage of the blood are as free as pos-

sible ; the cavities of the two vessels are separated, at the circumference of the opening, only by the thickness of their united partitions, and the tumour is formed entirely by the dilatation of the vein. In other circumstances, the cellular tissue that unites the two vessels, being more abundant and soft, adhesive inflammation produces a more intimate union between them ; and the blood soon raising the cellular sheath of the artery, there forms a false circumscribed aneurism, which serves as a channel of communication between the artery and the vein. In this case, the blood experiencing a certain stagnation in the cellular sac before it passes into the vein, there loses its fluidity, and this cavity becomes lined with polypous layers, like those of all other aneurisms ; whilst the blood that enters the vein, preserves its fluidity, and distends the vessel ; so that there is, at the same time, a false circumscribed and a varicose aneurism—two diseases, each characterized by its proper signs, and forming, at first sight, only one tumour. The obliquity of the wound, from which results a want of parallelism in the opening of the two vessels—any obstacle whatever to the free passage of the blood from the artery into the vein—an incomplete compression, that prevents the introduction of the blood into the vein only in as great a degree as into the artery, accelerate the formation of this complication.

Varicose aneurism shows itself sometimes three or four days after the bleeding that occasions it ; at other times, it does not appear until several weeks afterwards. It commences in the form of an oblong tumour, about the size of a hazel-nut at first ; afterwards it acquires that of a butter-nut. The centre of this tumour, which corresponds with the cicatrix of the wound that occasioned the disease, is always formed by the dilatation of the median or basilic vein ; when the disease is of long standing, the dilatation extends to the veins above and below the bend of the arm. When the arm is hanging by the side, the tumour augments in size, particularly when a slight compression is made in the arm-pit ; it diminishes, on the contrary, and even totally disappears, if the arm be kept elevated ; it likewise disappears on the slightest pressure, which leads us to suppose that a part of the blood it contains is pushed back into the artery. The pulsations of this tumour are very peculiar and remarkable ; they are synchronous with the beating of the pulse ; but they are only distinct in the centre of the tumour ; as you remove from this point, they become more feeble—are reduced to an undulation scarcely sensible, and, finally, completely disappear ; they are accompanied by a

kind of whizzing, similar to that of the wind forced out of a syringe; and this whizzing is sometimes so loud, that the patient is incommoded, and, if the arm be placed near the head, he is prevented by it from sleeping. If you place one extremity of a probe on the tumour, and the other in the fingers or between the teeth, or lightly lay a finger on the tumour, you may distinguish the trembling of its sides.

These symptoms sufficiently characterize the varicose aneurism; but this disease is anteriorly accompanied by the following phenomena:—If a ligature be placed on the limb, immediately below the tumour, and drawn so tight as totally to intercept the beating of the pulse above it, the tumour remains the same, its pulsations are as distinct as before, and, if it be made to disappear by compression, it re-appears the moment the compression is suspended; which certainly would not be the case, did there not exist an immediate communication between the artery and the corresponding vein. If, while the ligature is around the limb, the artery be pressed with the finger above the tumour, without touching the vein, the beatings of the aneurism disappear, the tumour flattens, and, if it have been entirely emptied by the compression, it does not re-appear, until the moment you cease to intercept the course of the blood in the artery. By compressing the artery above the disease, so as to intercept the course of the blood, and, at the same time, to empty the vein by compression, the tumour and its pulsations disappear in the same manner; by placing two ligatures, one above and the other below the disease, and retaining the blood in that part of the vein comprised between them, it ceases to be agitated by the pulsation; and, by alternate compression, we may almost always pass the blood from the vein to the artery, and *vice versa*. Finally, when the disease is of long standing, the artery constantly augments in size above the place of its injury, while its branches, below this place, become smaller; which is the reason that the pulse, in the inferior part of the limb, is always more feeble than in the corresponding artery on the other side of the body.

When the aneurismal varix is complicated with a false aneurism, although these two tumours mutually depend on each other, they are soon distinguished by their proper characters. Thus the least pressure is sufficient to push back into the artery the blood contained in aneurismal varix, and arrest the singular trembling; but then another tumour more deeply situated is discovered, the pulsations of which do not resemble those of varicose aneurism. This second tumour, situated on the artery, and formed by the distension

of its cellular tunie, soon becomes filled with clots of blood and polypous layers, that give it a more solid consistence, and make it irreducible. It then becomes more easy to distinguish the two aneurisms; for not only the pulsations of the tumours are different, but one is reducible by the least compression, and the other may diminish, and even cease to beat, by a sufficient compression, but never completely disappears. Further, false aneurism may grow on any side, according to the point of the cellular sheath most disposed to yield. When the disease is ancient, the tumour may present a form more or less irregular, which is not the case in the varicose aneurism, the form of which is always that of the varix.

The prognosis of varicose aneurism is much less serious than that of the other sorts of aneurisms; it makes much less rapid progress, and continues almost stationary, when it has reached a certain stage; indeed, its effects are merely a little numbness of the limb, which remains somewhat more feeble. The spontaneous rupture of this aneurism has never been observed. But when false circumscribed aneurism is complicated with varicose aneurism, the disease is much more serious; the violent movements of the limb may cause a rapid growth of the false aneurism, and the events of this last, regulate the prognosis and the treatment.

Varicose aneurism causes only a very slight inconvenience. Practitioners have confined themselves to palliative treatment. The patient is recommended to avoid painful and continued exercise with the affected arm, and to prefer that position of the limb in which it is habitually elevated; Cleghorn advised a young man who had this disease, whose trade was that of a shoemaker, to learn that of a barber. It is well to avoid wearing tight sleeves, and any other cause of compression which may retard the circulation in the veins of the arm.

The radical cure of varicose aneurism can only be obtained by the obliteration of the injured artery, and the ligature is the only means of effecting this object; in fact, compression, in whatever manner it may be applied, cannot have any favourable result, and may be injurious, when applied on the tumour itself. If it do not act on the whole opening, and particularly if it act towards the lower part, it only impedes the passage of the blood, without totally intercepting it, and may cause the complication of which we have spoken, or accelerate the growth of the false aneurism if it already exist, or render it diffuse; applied above the

tumour, it acts particularly on the superficial veins, and prevents the circulation of the blood through them; thus distending the varicose aneurism, and producing the same effect. The ligature of the artery is then the only thing that can be done; but this is proper only when the varicose aneurism is complicated with the false aneurism, and we fear the ulterior growth of the latter. It is then necessary to observe, that, if the operation be made according to the ancient method, after opening the varicose aneurism, you must penetrate into the false aneurism, and then into the artery; and in order conveniently to place the ligatures around this last vessel, the false aneurism must be opened in its whole extent.

Considerations on Aneurisms in particular.

It is very easy to apply to aneurisms of the different arteries what we have said of this disease, considered in a general manner; however, to complete this subject, we shall here add some particular observations on the aneurisms of the different external arteries.

Aneurism of the temporal artery is very seldom seen, and that of the occipital artery still more rarely; there is, however, reason to believe that compression may be applied with success in the treatment of these aneurisms, since the situation of those arteries unites the most favourable conditions for the employment of this mode of cure.

Aneurism of the labial artery has never yet been seen; should it be met with, the mobility of the parts in which that artery is placed, and the want of a sure and commodious resting-point, would render all other means than the ligature inadmissible.

In the *Ephemerides des Curieux de la Nature*, is found an example of an aneurism in the thick part of the concha of the ear, in consequence of a wound in that part. Gangrene of a part of the tumour caused its opening, and the bleeding was stopped with much difficulty. It must be allowed, that, in this position, compression would be impracticable, and the ligature very difficult; the most simple method would be, to endeavour to compress the posterior auricular artery against the skull; but such compression would then be useful only in case the artery originated from the occipital, as frequently happens; for it is probable, in any other case, a compression directed through the parotid gland, would with difficulty reach it, and would perhaps be insupportable.

It is difficult to believe there ever has been any certainty of the existence of aneurisms, in the internal and external carotid arteries; but there are authentic proofs of aneurisms of the common trunk of the carotids. Most frequently these are cases either of true or spontaneous false aneurism; for certainly, if the wound of this artery were considerable, the hemorrhagy would be too abundant not to render all the aid of art useless, and quickly cause the death of the patient. There, however, exist examples of sabre and gun-shot wounds, and violent distensions of the neck, that have been followed by aneurisms of the common carotid artery. Some of these causes have perhaps been complicated with constitutional predisposition.

These aneurisms grow on an elevated point of the carotid artery, more or less near the chest. When the tumour is situated near the origin of the artery, it occasions difficulty of respiration, by compressing the trachea.

There is not a part of the body where the diagnosis of aneurism is more difficult, and where it is so easy to confound this disease with tumours of another nature. On the one hand, obstructions of the lymphatic glands, or the cellular tissue that surrounds the artery, that of the thyroid gland, and particularly collections of matter which sometimes form there, resemble aneurism by the pulsation, which is communicated by the artery; on the other hand, aneurisms of long standing, that have ceased to pulsate, the skin of which is affected and ready to break, may easily impose themselves on inattentive practitioners for cold abscesses, as the neck is frequently the seat of these disorders. The error is much less dangerous in the first instance than in the second; and, in similar cases, it is better to be timid than inconsiderate.

When aneurism of the carotid is situated very high, and near an angle of the jaw; when the tumour is small, and there remains a sufficient space between that and the sternum, to penetrate quite to the artery, and uncover it.—the cure may then be attempted by Anel's method. This operation, of which Scarpa conceived the possibility, and which he did not hesitate to advise under favourable circumstances, was practised with success, on the 22d June, 1808, at Guy's Hospital, London, by Mr. Astley Cooper.¹

The patient was fifty years old, and had carried this tumour five or six years; it extended from the angle of the jaw quite to the os hyoides. An incision was made along the internal edge of the sterno-cleido-mastoideus muscle, commencing at the base of the tumour, and extending to

within an inch of the clavicle. On raising the edge of the muscle, he discovered the cellular sheath that contains the carotid, the internal jugular vein, and the nerve of the eighth pair. Blood spouted from two small arteries which were tied, but there was no other hemorrhagy. Mr. Cooper laid bare and turned aside the jugular vein, that was distended every minute by expiration, and that hid a part of the artery; it was easy to avoid the par vagum, but it was difficult to separate the artery from some small nervous branches; the handle of the scalpel served to isolate the artery sufficiently to pass two ligatures around it with a small hook made for the purpose. The first ligature was tied on the artery as low as possible; the pulsation of the tumour continued. The artery was detached above the first ligature for the space of an inch; the second ligature was tightened at the top of this space, and the artery was then cut between the two. The dressing was made by approximating the edges of the wound by sticking plaster, and putting a little lint on it. On the third day the tumour was firm, and appeared to contain only coagulated blood. During the first fifteen days nothing remarkable took place; the patient was only incommoded by a fatiguing cough, which occasioned an abundant and difficult expectoration. On the sixteenth and seventeenth days the ligatures came away; scarcely any beating was then felt in the tumour, which was reduced to one quarter of its volume before the operation. On the fiftieth day no pulsation was perceptible, the place of the tumour was perfectly on a level with the neighbouring parts, and the skin was wrinkled in consequence of the distension it had experienced. At the end of sixty-eight days, the wound was completely closed, and the patient perfectly cured. Notwithstanding the success obtained by Mr. Cooper, we cannot dissemble the great difficulties and the dangers of this operation; we imagine it never will be undertaken by the generality of practitioners; and the most skilful and experienced surgeons will hesitate to practise it, if all the circumstances of the disease do not appear entirely favourable.*

If the method of Anel can be applied in the treatment of the aneurism of the carotid in favourable cases, the reverse is true with respect to the ancient or ordinary method; the absolute impossibility of becoming master of the blood by compressing the artery below the aneurism, would expose the patient, if the tumour were opened, to fatal hemor-

* See note P.

rhagy, and prevent a prudent surgeon from attempting this operation.

Although true and spontaneous aneurisms be less frequent in the superior than the inferior extremities, they are, however, sometimes observed in the axillary artery. The deep situation of the vessel protects it from the action of wounding instruments; it may, however, be reached by a sharp-pointed weapon, and then it more easily forms a false primitive aneurism, as the mobility of the parts that surround it, render the course of the wound tortuous.

The situation of the tumour, covered by the pectoral muscles, and which cannot be felt directly under the skin, except in the armpit, may render the diagnosis difficult; for, on the one hand, the aneurismal tumour is more easily distinguished when it is situated very superficially; and, on the other, the tumefaction, of which the axillary glands and the cellular tissue of the armpits are susceptible, may occasion mistakes, particularly when the artery communicates its pulsations to the tumour. No very serious consequence would arise from taking any other tumour for an aneurism; but the mistake may become fatal to the patient, and unfortunate for the surgeon, if an ancient and voluminous aneurism, that has lost its beatings, whose base has become hard, and whose summit presents a point of fluctuation without alteration on the skin, were mistaken for a tumour filled with matter. In aneurism of the axillary arteries, fatal errors have been committed; and what ought to render young practitioners very circumspect is, that such misfortunes have happened to men very skilful and experienced in their profession.

Aneurisms of the axillary artery, like those of the inferior part of the carotid, are beyond the resources of art: compression and ligature are equally impracticable. A sentiment of humanity, very meritorious, no doubt, has induced distinguished practitioners to attempt to operate upon them; the trial has twice been made by men whose merit cannot be contested, Desault and M. Pelletan; the first had the misfortune to see his patient expire of hemorrhagy before the end of the operation; the patient operated upon by Pelletan, died a few days afterwards. We should think that these two experiments were sufficient to establish a positive rule; but, without searching to know if there be sufficient communications to supply the principal trunk, we shall only remark, that the small confidence those two operators had in compression of the artery on the first rib during the operation, induced Desault to raise together the artery and the

brachial plexus by a thread, so as to form an angle; and M. Pelletan to comprehend the whole in a temporary ligature. The means employed by the first did not save his patient from a fatal hemorrhagy; and the mortification of the limb, which occasioned the death of the second patient, leaves well founded doubts as to the effect of even a ligature on the brachial plexus; and should it be even possible to avoid the double danger, which is hardly conceivable, who could foresee the effects of inflammation of all the brachial plexus, which it would be necessary to lay bare at the bottom of the wound?

The operation performed by M. Pelletan having excited the attention of practitioners, it was proposed to the Academy of Surgery to pass a needle round the clavicle, with the intention of embracing this bone and the artery in the same ligature, which would have been an application of the process of Anel. L'Heritier, Professor of the Surgical School, made a number of trials on dead bodies, from which it appeared that the needle sometimes passed between the artery and the bone, at others through the vessel, and occasionally it embraced a part or the whole of the brachial plexus.

The greatest number of aneurisms of the brachial, radial, and cubital arteries, are false, and occasioned by external causes. It is observed, that those which succeed a wound in the superior part of the brachial artery, are almost always diffuse; whilst those that are occasioned by pricking the artery in the operation of bleeding, are constantly circumscribed and consecutive.

This difference, which cannot be explained by the greater or less exactness of the compression made in the latter case, is owing in part to the aponeurosis which surrounds the brachial artery in common with the muscles; while, in the upper part of the arm, the artery is enclosed only by the cellular tissue. The same reason accounts for the extension of the aneurism in the forearm, from below upwards. When it is caused by bleeding, it is generally seated in the brachial artery, sometimes in the cubital, but so near its origin, that it would be impossible to tie it. These observations, however, do not apply to those rare cases in which the humeral artery bifurcates above the forearm.

Compression and ligature may be equally employed in these cases; compression may be made on the tumour, or above it. The former is preferable, when the tumour is not very large; but the ligature is so easily applied, and is so successful, that it is preferable to compression; the effect of which is always slow and doubtful.

When aneurism is high up on the forearm, it is not always easy to determine whether it be seated in the radial or cubital artery; it is, however, important to do so, because the incision should correspond exactly to the situation and direction of the affected vessel, and because the radial artery may be always easily tied, while the ulnar is situated so deeply, that the pronator teres muscle must be cut across. This circumstance renders it preferable to tie the brachial artery above the aneurismal tumour, according to the process of Anel. The needle should be carried from within outward, so as to avoid the median nerve.

In a wound or aneurism of the superficial palmar arch, the ligature may be easily applied; but if the deep palmar arch be affected, the radial artery should be tied above the wrist.

Aneurism of the crural artery is generally spontaneous. In this artery, and in the popliteal, we observe the greatest number of aneurisms arising from internal causes; we find them sometimes merely pierced in a single spot; sometimes dilated in one or more places, with or without thickening their coats in the dilated point; sometimes dilatation and perforation occur together; sometimes both appear in different parts; occasionally a large proportion of the circumference of the vessel is destroyed, and the remainder reduced to the state of a membrane: it has even happened that the whole circumference of the artery has been destroyed, and the two ends of the vessel terminating in the aneurismal sac, have been connected together by the cellular membrane which forms the sac itself.

Aneurism of the crural artery is incurable, when the course of the blood cannot be suspended by pressure above the tumour. We have already stated our opinion of the operation successfully performed by M. Guattani, in a case of this nature. Mr. Cooper, on the 22d June, 1808, tied the external iliac artery, for an aneurism of the femoral artery, situated so high that the course of the blood could not be suspended by pressure above the tumour. The success of a hazardous operation does not justify hardihood in surgery: it has bounds, beyond which it becomes temerity to proceed.*

Aneurisms of the femoral artery, below the origin of the profunda, increase to a magnitude and with a rapidity proportioned to their proximity to the middle of the thigh; for here the vessel is surrounded with loose cellular tissue, and

* See note Q.

a thin fascia. In these cases, we find the fibres of the adductor muscles frequently frayed, and blood extravasated in the posterior part of the thigh, and affecting the sciatic nerve; the femoral artery, just before it passes through the adductor muscle, is enclosed in a sort of sheath, formed by a thick and strong aponeurosis, which proceeds from the vastus internus to the triceps adductor, and opposes the development of the tumour: hence aneurisms, in this part, progress slowly.

An operation is the only means of curing aneurisms of the femoral artery. Most frequently there is room enough for a ligature above the aneurismal tumour, without tying the vessel above the profunda; hence the old method is preferable to that of Anel, in which, by tying the artery above the tumour, we arrest the blood both in the deep and superficial femoral arteries. The same observation is applicable to the case in which aneurism is seated in the middle of the thigh; but when it is situated toward the lower part, and is spontaneous, it might extend far down behind the tendon of the triceps adductor; we should then prefer the old method.

In persons of very spare habit, where the aneurism is situated very low down, the artery may be compressed in the middle and internal part of the thigh. If this do not succeed, we should have recourse to the operation according to the old method. The patient is to be placed on his belly, the operator on his left, whichever side be affected; the limb is extended during the external incision and opening of the sac; it is a little flexed when the ligatures are applied. The incision ought to be parallel to the axis of the knee, and rather nearest the internal side of the articulation, so as to leave the sciatic nerve in the external lip of the wound.

Experience, however, has convinced me, that the operation of Anel is far better than that I have described.

Aneurism of the posterior and anterior tibial and fibular arteries is rarely spontaneous, it is almost always produced by an external cause. The diagnosis of aneurism of these vessels is extremely difficult, until very late in the disease. M. Deschamps operated upon a patient who had a hard tumour without pulsation, and as large as a hen's egg: it had formed gradually after a punctured wound, the hemorrhage of which was stopped by compression. M. Deschamps opened the tumour, removed the hard clotted blood it contained, and tied the artery above. When aneurism is situated high up on the leg, the method of Anel alone is practicable. A woman, more than sixty years old, broke her leg;

the fragments of the bones pushed back, tore the flesh at the posterior and internal part of the leg, without wounding the integuments : the limb became swollen, tense, and of a brown colour ; the pulsations were perceptible, and ceased when the femoral artery was compressed. There was no doubt that the posterior tibial artery was lacerated ; there would have been great danger in cutting down to the place of the fracture. Anel's method was adopted ; the limb retained its heat and sensibility ; the tumour gradually diminished, and the patient was cured : at the same time the fracture was re-united. A few such facts would establish, beyond controversy, the superiority of Anel's method.

CASES.

CASE 1st. *True Aneurism of the Popliteal Artery cured by Compression above the Tumour.*

A grocer at Paris had an aneurism at the bend of the leg, of moderate size, pulsating, and without enlargement of the leg. Messrs. Deschamps, Pelletan, Dubois, and myself, were called in consultation : we advised compression above the tumour, and told him that this ought to be done under the direction of a surgeon ; but a tanner of his acquaintance advised him to use a machine that had cured his father. He agreed to it—compression of the femoral artery above its passage through the triceps adductor, for eleven months, with the most perfect repose, cured him entirely.

CASE II. *Spontaneous Aneurism of the Popliteal Artery cured by Compression of the Crural.*

J. C. Michaux, a labourer, towards the end of October, 1804, experienced, while loading a cart, during a strong extension of the leg, a sensation of tearing, and acute pain in the ham. He soon forgot the accident, and continued his work : some time afterwards he experienced slight pain, stiffness and weakness in the leg, and putting his hand there, he felt a small pulsating tumour ; his work fatigued him, and the aneurism increased in size ; the limb swelled, its movements became difficult, and the patient, obliged to keep his bed, was brought to the Charité about three months after the accident. He was hale and strong, the aneurism was as large as an egg, circumscribed, soft, and oblong ; its greatest diameter being vertical, it yielded a little to compression, and its pulsations were very evident ; they ceas-

ed when the crural artery was compressed, and the tumour diminished; in other respects the knee appeared healthy, and its slight swelling disappeared after a few days of rest. I compressed the femoral artery immediately above its passage through the triceps adductor; at first moderately, and afterwards with considerable force. While the compression was moderate the patient was docile, but at the end of two or three months, the artery being exactly compressed, the foot, the leg, and thigh became swollen, the whole limb very large, and of a reddish marble colour; the tumour had ceased to pulsate, but the patient complained of a numbness of the whole leg, and the tourniquet was relaxed by the patient himself. He walked about: hence the tumour varied in size according as the patient followed more or less strictly the directions given him. In September, 1806, when I left him to accompany his Majesty, in the glorious campaign of Prussia, the tumour had become solid, its size had diminished, and its pulsations were much less distinct, although they were still perceptible when compression was removed. During the month of October of the same year, no great alteration having taken place during twenty months compression, M. Deschamps proposed the operation to the patient, who consented to it, but first asked to leave the hospital for a few days. He walked about town two or three weeks, and as the tumour did not grow worse, M. Deschamps resumed the compression. In ten days the patient declared that when he loosened the tourniquet, the pulsation did not return. This was found to be the fact, but the tourniquet was continued eight days longer, and the patient was discharged perfectly cured. I have seen him since; the aneurismal tumour has entirely disappeared; a cord is left between the condyles of the femur; the limb is as strong as the other.*

* Here follow eight cases of different aneurism, some of which were cured by compression on the tumour, some by compression above it, others by laying open the tumour, washing out the coagulated blood, discovering the source of the artery, and introducing a probe into it, and placing a ligature around; and, lastly, some by tying the artery above the tumour, and leaving it to be absorbed. It is hoped that the omission of these cases will be amply compensated by the very interesting details in the appendix.

Transl.

ARTICLE VII.

Of Varices.

Varices are knotty, unequal tumours, formed by the unnatural and permanent dilatation of the subcutaneous veins.

The structure of the veins, and the nature of their functions render varices very frequent. The sides of the veins are very thin, extensible, and do not possess any apparent contractibility. The impulse which propels the blood through them, is uniform and constant, so that any obstacle to its course, exposes them to constant and increasing distension. Their valves, especially those of their branches, prevent the return of blood, without hindering its further afflux, so that the distension of the vessel becomes extreme.

The muscles with which the deep veins of the limbs are surrounded, whose contraction supports their sides, and the pulsation of the arteries near them which accelerates the course of venous blood, sufficiently explain why these veins are rarely affected with varices, and why the superficial veins are most subject to them. The veins of the inferior extremities are most commonly affected; but they may be situated in the superficial veins of the arm and forearm, if there be a tumour in the axilla or breast. M. A. Severin* relates a case of varicose tumour in the hypogastrium, attended with considerable varices on the thigh. The abdominal tumour was formed by the intersection of varicose veins, resembling, as he expresses it, a head of Medusa; Celsus says they may take place in this region, but he does not give any example of the kind. I have seen a varicose tumour situated on the hypogastrium, and extending from the groins to the umbilicus; it was large, unequal, and blackish, but caused no pain.

Dilatation of the superficial veins of the abdomen is also observed in women who have had many children; but pregnancy more frequently occasions varices on the legs and thighs, sometimes in the veins of the vagina and labia pudendi.

Sometimes dilatation affects only one venous branch, but more frequently several. They become larger by time, and they even acquire considerable size: when this takes place they are apt to press upon the absorbents: hence the doughy feel that accompanies them. At the same time the blood

* De Abz. Recond. cap. ix. sect. 13.

coagulates and adheres to the sides of the vessels, especially near the valves; inflammation and tumefaction follow. This is the reason of the hard knots which take place in old varices, and which sometimes adhere to the skin.

The course of the blood upwards, weakness of the sides of the veins, and other unknown causes, give rise to this disease. It may also be occasioned by the pressure of a tumour either externally or internally; habitual ligatures, perhaps a spasm of the vessels: hence we see the reason why a tumour in the groin, an aneurism, pregnancy, and congestion of the viscera of the abdomen, are often attended with varices on the legs; and why washer-women, market-women, printers, rope-makers, &c. are most subject to the disease; why persons of melancholy constitutions are most affected with it; and why periodical evacuations from broken varicose veins have relieved maniacal and gouty patients who have had congestion of the abdominal viscera. But it is not so easy to explain the idea of Hippocrates,* when he says that they who are threatened with gibbosity or contortion of the spine below the diaphragm, are sometimes cured by the appearance of varices on the thighs and groins.

When the varices are small, they occasion no inconvenience; when they are large and numerous, they compress the lymphatic vessels, and cause a doughy congestion of the whole limb, acute pain, inflammation, sometimes followed by intractable ulcers; sometimes one or more veins are ruptured, and a copious hemorrhagy may ensue, without any inconvenience—without even debilitating the patient, in proportion to its quantity. These evacuations are generally occasioned by external violence: the varicose vein empties itself, and sinks without recovering in the slightest degree the power it has lost.

Varices depending upon an external cause are easily cured by the removal of it; when they are occasioned by a tumour in any of the cavities, they are rather indications of a dangerous disease, than dangerous in themselves.

A uniform pressure, by means of a bandage of laced stocking, is the best remedy for varicose veins; the latter, however, made of chamois leather, is far preferable; it should extend along the whole length of the limb, and be laced on the outside behind the ankle. If the varices extend also to the thigh, this part requires a similar envelope. A sufficient interval, however, must be left for the free motion of

* *Lib. de Articulis, sect. 2.*

the knee joint. But it is very difficult to cause an equable pressure to be made on the upper part of the thigh.

Compression, in whatever form it be applied, is only a palliative remedy; for the veins will never contract to their natural diameters.

Compression is not admissible in old cases, where the veins are hard, knotted, tense, and painful, as it might cause ulceration. Leeches should be applied in such cases to the dilated veins, or opening them with a lancet. Paré performed this operation with great success. The vein is to be compressed above and below the place where the incision is to be made. If it adhere in any part to the skin, this is the best place to puncture. When the blood between the compressed points is discharged, compression is to be made along the course of the vein, by a compress and bandage, which should not be taken off until the opening has healed. If the tension and pain cease when they are removed, a laced stocking may be applied.

The maxim of Celsus is, that "every diseased vein should be burned, or cut out." Pliny relates that Caius Marius, he who was seven times consul, supported, without complaining, even without sitting, the extirpation of a great number of varicose veins, with which his legs were covered. When the operation was finished on one side, the Roman hero would not submit to a similar treatment of the other; saying, that the remedy was worse than the disease.

Excision can only be justified where the agglomerated varices form a single, hard, circumscribed, and painful tumour. I was once induced, by the solicitations of a patient, to perform this operation. M. —, aged twenty-four years, large and well made, had three or four varices on the external and middle part of his leg; which, together, formed a knotted tumour about three inches broad, and in the form of a semicircle. They caused no inconvenience, but produced deformity, so that the patient was obliged to wear boots to hide them. I endeavoured, in vain, to dissuade him from the operation, but finding him inflexible, I cut the skin along the arched edge of the tumour, and then dissected to the opposite side; and having exposed the veins which formed the tumour, and those which passed from one part to another, I then tied the latter, cut them, and removed the whole of the tumour. He was quickly cured.

ARTICLE VIII.

Of Bloody Fungus, or, Fungus Hæmatoides.

This singular disease is little known. There are two very different kinds. One congenital, and another which might be termed accidental, since it is generally excited by external violence.

The first kind begins with a rose-coloured spot, which appears in new-born infants. This spot is generally very small, not unlike a flea-bite. The tissue of the skin alone is diseased. Sometimes they remain stationary for several years. At other times they increase at the age of puberty, or during the period of a difficult menstruation in females; but most commonly tumefaction commences at a very early age, and makes rapid and dangerous progress. In this case the spot begins to enlarge; its colour becomes deeper, especially when the patient cries; a tumour appears beneath the skin, and projects beyond the discoloured spot. This tumour is unequal, rough, irregularly circumscribed, consistent, compressible, and elastic, especially when the child is agitated. It adheres to the skin, and, in some cases, to the subjacent parts. It is indolent, and without pulsation, unless it be near a considerable artery. It appears on the forehead, the root of the nose, in the substance of the eye-lids, in the lips, in the lobe of the ear, in the labia pudendi, on the anterior part of the top of the shoulder, &c.

It is probable, that if tumours of this kind were left to themselves, they would terminate like the second kind.

This disease is sometimes caused by protracted compression, or a contusion of the part; sometimes it arises without apparent external cause. An obtuse and obstinate pain comes on and continues in the same spot before it undergoes a total change. A colourless tumour next appears; at first small, moveable, indolent, elastic, slow in its progress, and painful when it has attained a considerable volume; increasing rapidly after strong efforts of the part in which it is situated, or after any violence whatever, and in other respects similar to the preceding. There is no natural limit to their growth; the skin which covers them becomes thin and distended, until it breaks or mortifies; frequent hemorrhage supervenes; the blood oozes out; it is easily stopped by compression, but seldom permanently arrested; a fungus shoots out from the

opening in the skin; it enlarges and bleeds upon the slightest touch; fever comes on, and the patient dies, exhausted with pain and hemorrhage.

These tumours sometimes present, in the centre, a sort of fluctuation, which might lead to the belief that they were abscesses; but we shall avoid this error, if we examine attentively the form of the tumour, and all the circumstances which have preceded and attended its appearance. If we are led into mistake by the fluctuating feel of the tumour, which may depend upon its softness, or upon a collection of blood, and proceed to open it, liquid black blood escapes. Lint and compression suspend the hemorrhage only for a time; it returns incessantly, and may prove fatal. This kind of tumour has been seldom seen, except between the shoulders, on the internal side of the arm, in the breasts of women, in the groin, or the inside of the thigh.

In both species of this tumour we find the subcutaneous cellular tissue changed to a cavernous substance; sometimes of a fibrous consistence; at other times breaking under the fingers; generally whitish, but occasionally of a fatty appearance, forming areolæ of unequal size, but communicating with one another. This spongy substance, which has been aptly compared to the placenta and spleen, is abundantly supplied with arteries and veins.

In the first species, the peculiar organization extends to the skin inclusively. Even there it commences, and hence the rose, the lively red, the brown, and marbled colours which it successively presents. In the other species, the skin is secondarily affected. It does not partake of the spongy structure of the cellular tissue, but merely becomes distended, thin, and adherent to the tumour.

In both species the tumour sometimes affects the cellular tissue under the skin, and between the adjacent muscles, which it merely separates, displaces, and renders thin; but almost always the muscles partake of the disease. The external part of the tumour is of a very different structure from the internal. It does not form a coat like atheroma and melicæris; but is tenacious and ligamentous, perhaps even ossified in particular points, though the bones seldom partake of the disease, as in aneurism, or lymphatic tumours. In some cases, however, where all the soft parts of a limb have been diseased, the bones have been found spongy.

The large vessels seldom partake of the disease. Sometimes their coats are affected, and even opened by the extension of the disorder to them. They are not ulcerated in one large place, but in several minute points, like a sieve. From

these observations we see the impropriety of applying the term *fungus hæmatodes* to these spongy tumours.

Although we may determine when the disease is congenital, or when it is contracted at the mother's breast, we are altogether ignorant of their cause. Some very peculiar and extraordinary mechanism must take place. When they are once formed, external violence and straining hasten their progress, and make them painful. These causes even occasion an ecchymosis, which extends to a considerable distance, and produces a rupture of one or more cells of the arcolar tissue, in which the blood is contained; but this is quickly dissipated.

Lenet relates a case of a child of ten years of age, who having bruised his foot against the ground, was affected with one of these tumours above the external malleolus. It extended and occupied the whole instep and ankle, and the space between the bones. A surgeon, deceived by apparent fluctuation, opened it. A fungus appeared, and the consequence was, that partial amputation of the foot was performed. Fungus appeared on the stump, and a simliar tumour formed in the groin, which hurried the patient to the grave.

The thinness and discolouration of the skin are so striking in congenital spongy tumours, that they cannot be mistaken for any other; and the absence of enlarged veins distinguishes them from varices. Although their proximity to a large artery may cause them to pulsate, yet the peenliar pulsations of aneurism, and their expansive force, will prevent us from confounding these diseases. The inequality, the tuberculated surface, and the elasticity of spongy tumours, distinguish them from cold abscesses, although the skin be thin, inflamed, and ready to burst; and even though there be an apparent point of fluctuation. Moreover, these diseases do not appear circumscribed, either to the sight or touch.

A soldier of the name of Pochard, aged twenty-six years, of a feeble and delicate constitution, felt in the left forearm, a sensation, which he described as similar to that produced by a ball passing through it. Some days after a tumour, as large as a filbert, appeared on the anterior superior external part of the forearm; it was soft, indolent, circumscribed, without fluctuation or alteration in the colour of the skin. It enlarged slowly for three years; after a severe pain, ecchymosis took place, and increased rapidly. The severe pain he suffered led him to consult several eminent practitioners in Paris, who differed in their opinions as to the nature of the tumour, but agreed in the

propriety of opening it. Caustic potash was applied, and the eschar was cut; but instead of matter, black blood was discharged. For fifteen days he suffered great pain at each dressing, by reason of the compression necessary to stop the hemorrhage. Suppuration then came on, and the wound healed. The tumour soon formed again, and, at the expiration of eleven months, was larger than at first. It was incised throughout its whole extent; some clots of blood were discharged, and some of the spongy structure of the tumour. In the bottom were found several long concretions, which were extracted, and believed to be the cause of the tumour. After a time the wound healed; one month subsequent to its cicatrization the tumour re-appeared, and, at the end of a year, was as large as at first. It was soft, not fluctuating and circumscribed. The return of pain increased its volume and the feeling of tension in the part. The patient could assign no cause for it, but the tightness of his sleeve, and the pressure of his musket. A consultation was called. The alarming nature of the tumour led to a proposal for amputation of the arm. I was of opinion that extirpation might throw some light upon the nature of this singular disease, while it would not prevent amputation as a dernier resource. The operation was performed in presence of my distinguished colleague, M. Sabatier. The brachial artery was compressed, and two half elliptic incisions were made around the tumour, which was separated from the muscles to which it adhered. The radial artery passed through the centre of the tumour, so that it was necessary to tie above and below it. The bottom of the wound appeared healthy, and completely deprived of every part of the tumour. The complete healing of the wound on the fiftieth day after the operation excited hopes of a radical cure. The tumour seemed to be caused by a diseased state of the radial artery. But two months afterwards the cicatrix was raised by a new tumour of the same kind as the first; and four months afterwards, when I saw the patient, it was as large as the head of a new-born infant, and caused excruciating pain, which evidently arose from the distension of the parts. I declared that amputation was then the only resource; but the patient, being young, required another trial, to assure him that nothing else could relieve him; I was, therefore, obliged to cut the whole length of the tumour, and having thus ascertained its spongy structure, I immediately took off the limb. The patient completely recovered. He lived several years afterwards, having lost a number of his relations by the same disease.

The dissection of the amputated limb discovered a cavernous cellular tumour, formed at the expense of the cellular tissue, containing blood, presenting no appearance of dilated vessels, extending along the three upper fourths of the anterior part of the forearm, between the displaced and thinned muscles, and penetrating to the inter-osseous ligament, which, as well as the bones, was unaffected.

A woman had a tumour of the same nature on the upper and posterior part of her thigh. It was of a moderate size, and apparently circumscribed. M. Cousin, whose patient she was, called M. Dubois and myself in consultation. We advised the extirpation of the tumour, which was performed under our eyes, with great care. The muscles were isolated and dissected, as if for an anatomical preparation, in following the course of the tumour. The wound healed rapidly; but, soon after, the tumour re-appeared, and having extended upwards, to the lower part of the buttoek, extirpation and amputation were alike impracticable. The disease progressed, and the patient died.

Those tumours which appear on new-born children are less dangerous than others. When they do not increase, they are unattended with danger; otherwise, especially if extirpation or amputation be impracticable, they prove fatal by the long-continued pain, or the successive hemorrhages they occasion when they open. If situated near a large vessel, they are perfectly incurable. Such was the case related by M. A. Severin, which he cured by an operation too hazardous for imitation; such was the tumour depicted by Lamorier, which occupied all the upper extremity, to the shoulder and chest; such is the disease described by Scarpa, in his splendid work on aneurism, and which is accompanied with very interesting details and dissections. If one of these tumours be seated on the lip, an eye-lid, or on the ear, and extend to a cavity, it is incurable. Tonics, astringents, and compression, are alike useless. I cannot forbear, however, relating a case, which is without example in its kind, of which I was an eye-witness. About ten years since, I was consulted in the case of a child, two years of age, who had one of these tumours near the attachment of the upper lip, consequent to a congenital mark. The disease extended under the nose. This prevented complete extirpation, and I merely advised the mother to foment the tumour with alum-water, and to compress it as often as she could, by laying the fore-finger across the lip below the nose. I did not attach much importance to this counsel, unless the tumour remained stationary; but it

was followed with all the assiduity of maternal solicitude. The anxious parent often kept her finger on the lip seven hours at a time. In the month of August, 1809, being again called to the child, who was then twelve years of age, I saw no trace of the disease. It is probable that, in this case, compression effected a cure, by obliterating the principal artery of the tumour, and that it was taken up by the lymphatics. Whatever be the fact, this case forms a happy exception to the general fatality of this disease.

It is not necessary to descant upon the difficulty and danger of cutting into these tumours. If, by mistake, one of them be opened with a bistouri, or by sloughing, we should hasten to extirpate it, or amputate the limb; or if both these be impracticable, we should make, upon the whole extent of the tumour, a pressure sufficient to prevent hemorrhage, and repress fungus, which renders desperate every case in which it appears. We should not remove the dressings until suppuration be fully established, lest the bleeding return; and happy shall we be if sufficient inflammation come on to close the open areolæ, so as to oppose a barrier to the blood, and allow the wound to heal.

Severin relates an example in which this disease was cured by the repeated application of the actual cautery: but this remedy is not only cruel, ineffectual, and subject to all the inconveniences of incision, but highly dangerous in cases like that in which he employed it; for the tumour was situated near the crural artery, the opening of which would have proved immediately fatal.

Caustics have all the disadvantages of the knife, and can never destroy all the diseased structure.

A child was born with two tumours of this kind; one on the upper and internal part of the left arm, the other on the upper part of the chest. The latter alone having increased, attracted the attention of the parents. One of the surgeons consulted, believed it an encysted tumour, and applied a piece of caustic potash. After the separation of the eschar, a fungus sprouted up, which bled upon the slightest touch; styptics were applied daily to stop the hemorrhage. The surgeon called me to see the case. The patient could not have supported the requisite operation. I advised that the base of the tumour should be tied, and compression made upon the tumour when the fungus had separated, with a view to effect the healing of the wound, so as to place things on their former footing; but, after the fungus fell off, new tumours appeared, and the child died of exhaustion.

In extracting these tumours, it is better to remove the skin which covers them, even though (as in some cases of the disease that are not congenital) it do not appear diseased. There may be an exception to this rule, when the tumour is situated on the face.

The daughter of M. ———, employed at the Mint of Paris, was born with a small red spot, the ordinary prelude to one of the tumours. It was situated on the side of the nose, and, for some time, gave no uneasiness to the parents; but swelling took place under the skin, and extended over all that side of the nose. Some medical men advised applications, some compression, which, however, was impracticable, from the situation of the disease. The child was eight months old when I saw it; the tumour then extended from the furrow in the upper lip to the internal canthus of the eye. We advised extirpation while it was yet possible, and before the lachrymal organs were affected. I made a semicircular incision on the external side of the tumour, and cut inwards, raising a flap, and thus removed the tumour and every diseased part, with the utmost care. This part of the operation was rather difficult, on account of the blood which the dilated arteries going to the tumour gave out, and which, by reason of the smallness of the space, could not be compressed with a finger. The wound was dressed with dry lint, moderately pressed upon the surface, which stopped the bleeding; suppuration followed; the flap of skin was then re-applied, and a semicircular cicatrix was left. The child, now eight years of age, has had no return of the disease.

When these tumours are extensive, amputation is the only resource. We should be sure to cut above every diseased part. We find a case related by Mr. William Hey, calculated very strongly to enforce this precept.

A mason, aged twenty-one years, had one of these tumours on the inner part of the thigh and knee; it had commenced two years before, and had increased rapidly, after a strain and a bruise; the integuments opened, and a large fungus shot forth. Extirpation of the tumour was tried, and found to be impossible. Mr. Hey resolved to amputate at once; but a thin portion of the tumour extended quite high up in the internal side of the thigh, and the operator hoped that inflammation would change the nature of this part, which was much less diseased than the rest. The cicatrix formed rapidly, but fistulous orifices remained opposite to the diseased part, whence blood constantly flowed. Mr. Hey laid bare this cavernous substance, and removed

nearly all of it ; but the contact of air did not produce the good effects that were expected ; a new fungus rose up, and the hemorrhage prevented any further attempt at extirpation. The stump again healed, but the patient died of exhaustion soon after.

Searpa relates the case of a man, aged twenty-four, who, for seven years, had a tumour in the angle of the tibia, about four inches from the patella. It was pulsating, soft at its apex, and hard at its base, which seemed to be formed of the bone itself ; there was also tumefaction on the back of the leg, under the muscles of the calf. The patient attributed his disease to his being gored by a bull. The tumour was considered as an aneurism of the anterior tibial artery, which had destroyed part of the tibia. He would not undergo amputation, and returned to Plaisance, whence Dr. Morigi had him sent to Pavia. One year afterwards, the disease had made great progress, and the patient suffering severely, begged to have his leg taken off. Morigi amputated, and having injected the vessels of the limb, sent it to Searpa, who was greatly surprised to find the tibial and femoral arteries quite natural, and, in place of aneurism, to see a sac formed at the expense of the tibia, the cellular sides of which, compared by Searpa to the uterine surface of the placenta, were covered with vessels extremely dilated, the ends of which had suffered the injection to fill the cavity, where it was mixed with blood. The patient got well ; but, five years afterwards, the stump of the thigh became painful and swollen, and formed a tumour, attended with pulsations and crepitation. The patient died of consumption ; and Morigi having injected the iliac artery, sent the preparation to Searpa, who found the end of the femur destroyed to the trochanter, and a tumour, like the first, in its place. What analogy is there between this disease and spongy sanguineous tumours ?

We shall conclude this article with a few observations on *nævi materni*.

These spots consist sometimes in a simple alteration of the colour of the skin ; at other times, with this alteration, there is an elevation, and occasionally hairs are growing out at the part. The colour of the skin is sometimes yellowish, sometimes more or less brown, sometimes red. In this last case, its intensity is increased by violent passions, and during menstruation, and sometimes becomes the channel of the menstrual flux. The swelling is never great, but the surface of the tumour is rough, not unlike a mulberry.

Nævi materni affect merely the mucous tissue of the skin ;

and sometimes the secretion alone is changed, giving rise merely to an alteration in the colour of the part. But frequently the vessels of the skin assume an extraordinary size, and the hairs grow to an unusual length and magnitude.

These deformities are never dangerous, and are attended to only when they are seated on an exposed part. They may be removed by the knife or caustic; but a cicatrix remains, almost as deformed as the original blemish.

ARTICLE IX.

Of Schirrus.

Schirrus is a hard, moveable, circumscribed, elastic tumour; generally indolent, or not very painful when touched, and capable of terminating by resolution, or degenerating into cancer. Schirrus may attack all parts of the body, but it affects most commonly the testicles, the female mammæ, the lymphatic glands, the uterus, and the ovaria; it takes place more rarely in the globe of the eye, the tongue, the penis, and other organs that are not glandular.

This disease does not appear indifferently at all the periods of life; it is rare in infancy and youth; it seldom occurs in the breasts of women before the age of thirty, and not generally until forty or fifty; it usually appears at the cessation of the menses, and most frequently in women who have been subject to some irregularities in this evacuation, and those who have led a life of celibacy.

Sometimes schirrus is very small, as when it is seated in a lymphatic gland; at other times it is of moderate size, as we commonly find it in the mammæ of women, and in the testicles of men; but, in this case, it is hard, painful, unequal, and frequently degenerates into cancer; at other times, although the schirrus be very large, it is, at the same time, elastic, soft, indolent, and occasioning pain only by its magnitude and weight, or by the compression it causes on other parts. In this last case, cancer is less to be apprehended; and if it be not seated in or near a vital part, the patient may live to a very advanced age.

Schirrus is formed by the lymph, arrested in its tubes and in the adjacent cellular tissue. Its causes are either external or internal. Among the first, we should reckon topical repellents, inconsiderately applied to inflamed glands; external violence, which produces only slight inflammation,

such as moderate contusion and compression, and irritating applications of every kind ; but schirrus rarely depends entirely upon external agents ; more frequently they only hasten the developement of an internal cause.

The internal causes of schirrus are, the suppression of an habitual sanguineous evacuation, such as the hemorrhoids, catamenia, or any morbid evacuation ; the healing of old sores, syphilis, herpes, psora, and especially a cancerous diathesis.

Experience has proved, that living in a damp and cold atmosphere, want of exercise, bad nourishment, deep and lasting grief, favour the developement of schirrus ; there is also an hereditary predisposition to this disease.

The signs of schirrus are easily deduced from its character and varieties. Sometimes it appears in the form of a hard, circumscribed, smooth, moveable tumour, differing from encysted tumours by its want of elasticity, without change in the colour of the skin ; causing a sensation of weight, heaviness, and distension ; commonly indolent, and inconvenient only from its bulk ; sometimes small, as when it is confined to a lymphatic gland, or a portion of the breast in women ; at other times affecting at once the whole of the organ in which it appears, as we sometimes see in the mamma and the testicle ; and, in this last case, if it become knotted, it quickly assumes the other characteristics of cancer. Sometimes, after its first appearance, the tumour remains of the same size, and indolent, for life ; sometimes it increases for a certain time, with pains proportioned to its augmentation, and afterwards remains indolent for a longer or shorter period ; at other times its increase is periodical, particularly when it affects the breast of a woman whose menses are obstructed. In these cases, the pains and volume of the tumour increase at each monthly period ; and, in the intervals, both are diminished. We should distinguish this abatement from a real relief of the disease.

I once mistook an encysted tumour, with a hard base, for a schirrus : such a mistake can never be material, since both require extirpation. Schirrus is justly regarded as the germ of cancer ; in fact, it almost always leads to cancer, whether it arise from an external cause, or be developed spontaneously ; but, in some cases, it terminates by resolution. Cancer sometimes arises from the application of irritants to a schirrus, but most commonly from an internal and unknown cause.

Schirrus generally remains stationary, or, at any rate, seldom produces cancer, when it is seated in the submaxillary or mesenteric glands, in the liver, ovaria, &c.

Schirrus is sometimes resolved ; it is difficult to speak with certainty as to the manner in which resolution takes place, but, reasoning from analogy, we suppose it is effected by the restoration of the functions of the absorbent system ; we certainly know, however, that every error in regimen, and every irritating application, oppose this happy termination.

Schirrus is much more dangerous in adults, in whom cancer is most common, than in young persons, in whom this disease is very rare, and more easily terminates by resolution. Persons of a bilious temperament, of an irritable constitution, and a melancholy, morose character, are most subject to schirrus and cancer. Lancinating pains, and a knotted surface of the tumour, indicate the approach of the latter.

Schirrus from an external cause, is less serious than that which appears spontaneously ; that which appears in women, at the cessation of the menses, is most dangerous of all.

When the schirrus is recent, small, not painful, yielding to the pressure of the finger, without any stony hardness ; when the patient is young, and of a good constitution ; when the disease has arisen from an external cause, or from an internal one, which can be removed ; and when resolvents have not already been unsuccessfully applied, we may hope to obtain a resolution. Under different circumstances, extirpation is the only remedy.

If resolution be judged possible, we should first learn the probable cause of the disease, and act accordingly. The suppression of any evacuation which may have preceded the disease must be remedied, or some vicarious discharge must be established ; though this is far from replacing entirely the natural evacuation. But we must not be led into error : sometimes the suppression of an habitual evacuation is only a secondary symptom—a consequence of schirrus, which itself depends upon some far more serious internal cause.

The venereal disease often occasions swellings, which readily become schirrus. The greater number of these affect the testicle ; and the treatment proper for such affections completely succeeds, as we shall show hereafter.

An improper treatment of the itch, or an herpetic affection, may occasion a swelling, which will terminate in schirrus. The indication, then, is to inoculate the patient with the repelled disease, and to excite inflammation in the seat of the herpetic affection, by means of friction. The skin must be protected from variations of the atmosphere, and cutaneous perspiration must be kept up with great care, by clothing suited to the season, and by dry frictions over the whole body, and even by slightly diaphoretic drinks ; for it

is found that cold and moisture are singularly injurious. A dry atmosphere is, therefore, to be preferred.

Beside these particular indications, it is proper to cause the patient to abstain from the use of acrid and irritating aliments, and spirituous liquors; but the regimen must be varied according to the circumstances of the case. For sanguine patients, it should be cool and relaxing; slightly stimulating for those of a lymphatic temperament, and cooling for the bilious. The exercise should be moderate; in some cases, perfect rest is necessary. Depressing passions of the mind are always injurious.

If the patient be young, vigorous, and of a sanguine temperament, and if, at the same time, an habitual sanguine evacuation have been suppressed, bleeding, or the application of leeches, is beneficial. In every case, cooling drinks are proper. We should then use aperients, such as the clarified juice of wild chicory, to which may be added suitable doses of a neutral salt; after which we should prescribe laxatives, either vegetable or mineral, taking care not to injure the organs of digestion.

The extract of hemlock has received a celebrity for the cure of scirrhus, which experience has not justified; in fact, there is not a single well authenticated case in which it has cured the disease. I have often used it for a long time, and in large doses, without ever having seen it produce any good effects.

As to the external treatment, we should first employ emollients and relaxents; such as poultices of linseed, marsh-mallow water, &c. When the scirrhus begins to soften, and ceases to be painful, we may employ discutients, but must be careful not to excite any irritation on the tumour: soap and water answers the purpose extremely well. When the part becomes less sensible, we may employ successively solutions of galbanum, ammoniac, sagapenum dissolved in vinegar, camphorated and mercurial plasters. If, notwithstanding the use of these means, the tumour increase, we must not delay the operation, lest the disease extend beyond our reach, when a radical cure can never be made. It too often happens that the most careful extirpations do not prevent a return of the disease. If we cannot operate, we must be contented to cover the tumour with fur, and prescribe opium.

ARTICLE X.

Of Cancer.

Cancer is generally a consequence of scirrhus. It appears in the form of a hard, unequal tumour; at first indolent, and afterwards the seat of burning and lancinating pain. It often opens spontaneously, and forms a disagreeable ulcer, whose edges are hard and turned back, of an unpleasant appearance, and which discharges a fetid acrid ichor, and finally proves fatal, with symptoms which bear no resemblance to consumption and decay from any other cause.

Women are more often affected with this disease than men. The predisposing causes are the same that favour the production of scirrhus; it attacks also the same parts, and some others, such as the lips, especially the lower lip; the tongue, face, and scrotum, are often the seat of encysted and steatomatous tumours. They usually extend to the muscles and other adjacent parts, all of which become homogeneous by uniform ulceration. It is questionable if osteo-sarcoma, or the conversion of bone into flesh, be a cancerous disease. What are the internal parts which cancer affects? We may answer without hesitation, the arteries, the extremity of the rectum, and the pylorus. Analogy would lead us to enumerate many other parts, but the diagnosis of internal cancer is too uncertain to enable us to speak positively on this point. Dissection is the only means of ascertaining the existence of the disease in the viscera, when it has returned after extirpation of a cancerous tumour.

Cancer, like scirrhus, suffers regular exacerbations at the menstrual period; and when the catamenia are obstructed, or have ceased, it rapidly grows worse. But the accidental suppression has far less influence than the natural cessation of this discharge.

Cancer of the lower lip sometimes begins with an indolent tumour on the skin, more or less painful, which ulcerates, and makes rapid progress, as we observe in cancer of the face; superficial elevated chapped tubercles arise, and discharge a mucous matter, which air dries into a yellowish, or greyish crust, and attended with itching and lancinating pains. In the breast a part only is diseased; in the testes, on the other hand, the entire gland becomes affected. Though sometimes it is confined to the epididymis, where it usually commences. In this case, the tumour is at first hard, unequal, and painful. This is the worst kind. When the whole body of the

testes is affected, it is less hard, elastic, and indolent, and continues in this state for a long time. It is, however, doubtful if this be true cancer. The lymphatic glands are not often affected primarily; they receive the disease usually from the absorbents.

When cancer affects the uterus, marasmus and consumption take place. At other times, the violence of the pains is the only symptom which is manifested, and the patients die with colliquative disorders, or emaciation; while cancer of the breast is always followed by them. Whence arise these differences? Do they show a difference in the disease?

The particular manner in which cancer proves fatal, is entirely different from any other disease, and deserves the attention of practitioners. It is worthy of remark, that some cancerous patients have an exquisite sensibility and irritability. On the other hand, after the extirpation of cancerous tumours, we often observe nervous diseases more or less serious; such as epilepsy, chronic tetanus, the total loss of intellect, &c. To what degree, and by what reason do these effects arise? From the cause of cancer, or from cancer itself?

The predisposition to cancer is transmissible from one generation to another; and young patients, in whom it appears, have probably received it from their parents.

Sometimes cancer appears after violent grief; or after the suppression of the catamenia, the hemorrhoids, or any suppurating sore. At other times it follows an injury; perhaps a very slight blow upon the affected part, or some irritation, mechanical or chemical, excited in a part previously diseased, but without any apparent tendency to cancer. Thus it appears in encysted and stematous tumours, frequently touched with caustic; warts on the skin, which have been torn with the nails; the globe of the eye, distended by its humours; or in hydrophthalmia, punctured several times with a lancet. Cancer coming on in any of these ways, is equally dreadful with that arising from an internal cause. But it is to be observed, 1st. That cancers which are formed, have not been preceded by any violent emotion of the mind, no particular derangement of the functions of healthy persons, and without external injury to the part affected. 2d. That very many contusions of the severest kind, of the breast or the testicle, are not followed by cancer, and are readily recovered; while the violence which has preceded the formation of a cancer is usually very slight, very little thought of, and generally mentioned by the patients themselves with great doubt and uncertainty. Such a dis-

proportion between cause and effect, leads us to believe that violence can only favour the developement of cancer, and that it always arises from an internal constitutional cause; in fact, that external violence has the same influence in the production of cancer, as it has in that of caries, necrosis, or spina ventosa. 3d. What connexion is there between cancer and the irritation excited in parts affected with other diseases, by which they assume the form of that disease? Let it be remarked, that one kind of structure or tissue alone is not concerned, nor one organ, nor one disease; but different organs, of diversified structure and functions, and differently diseased. May not the primary disease, in these cases, have resulted from the weaker action of a cause identical with that of cancer, and the local irritation merely hastened the formation of this intractable disease? On what other principle shall we explain the fact, that, after partial extirpation, some wens are completely cured; while a similar treatment is followed, in other cases, by cancer? As to the suppression of habitual evacuations, especially the menstrual, it cannot be denied that cancerous tumours, which were indolent and stationary for a long time previous, become painful, and ulcerate at the period of their natural cessation. But, on the other hand, many cancers form and ulcerate before this period, and even without the slightest irregularity in their function; and in any case, the most that can be charged to the cessation of the menses, is an aggravation of the disease. The accidental interruption of this discharge has no sensible influence on the disease. Finally, it much oftener happens that cancer having appeared in the decline of life, the pains it occasions cause some variations in the catamenial discharge: whence it results, that when the disease is seated in the breast, there is an orgasm, a swelling, and an irritation at the menstrual periods. These phenomena, which Lecat has improperly termed the menses translated to the breast, arise altogether from the lymphatic connexions between the mammae and uterus, and take place only when the disease is seated in one of these parts.

Now, if we consider that cancer is connected with a peculiar constitution, or some remarkable affection of the nervous system; that it reduces every part that it affects to a homogeneous fatty substance, of a greyish-white colour, showing no similarity to its original structure; that the most careful and complete extirpation does not in any case secure the patient from a return of the disease; that very serious and often dangerous nervous diseases follow the operation; and lastly, that it is an hereditary disease; if we consider, I say,

all these circumstances, we must admit the existence of a specific constitutional cause; and that every other cause is only occasional or exciting. This unknown cause is termed the *cancerous virus*.

Peyrilhe thinks that cancer is always a local disease, and that the absorption of ichor secreted in cancerous sores, produces what is called the cancerous diathesis. The swelling of the lymphatic glands, at a certain period of the disease, would seem to favour this opinion; but experience is far from justifying this consoling hypothesis.

If it were true, extirpation, performed previously to the appearance of glandular swellings, would always eradicate the disease; which is not the fact.

Is cancer contagious? Experiments, made with a view to ascertain this fact, are contradictory, and inconclusive. Until the diagnosis of cancer be better known, there must always be doubts as to the genuine character of the matter employed as the vehicle of contagion.

We have already observed, that cancer may follow scirrhus, or appear without it. Nothing is more difficult than to draw a line of separation between these two diseases. While scirrhus remains stationary, it is indolent, moderately hard, and regular in its form; it is inconvenient only by its weight, or vicinity to other organs, whose functions it may intercept. When it is about to change to cancer, it becomes hard and knotted; lancinating pains are felt, sometimes rare, and of very short continuance, or burning and more lasting. They come on spontaneously, or are excited by a moist and electrical state of the atmosphere. They also occur some moments after the tumour has been handled. The first of these states has been called *mild*, the latter *malignant*. The tumour increases; the veins proceeding from it become varicose; the cancerous mass becomes more fixed; some points of the skin become corrugated and depressed; the pores of the skin become dilated, and visible to the naked eye. It is then inflamed over some parts of the tumour.

At this period the tumour is homogeneous, fatty, greyish, and consistent; no trace of cellular substance is visible, nor any vessels, or signs of organization. At a more advanced stage, we find it containing, in the centre, or opposite the projecting points, an ichorous, reddish, acrid matter, which quickly oxydises metals. A similar fluid oozes from every divided surface of the mass.

As the tumour progresses, the elevated parts soften, the skin ulcerates, and we see the ugly sore, whose edges are thick, hard, and turned back, of a pale red or livid colour,

and discharging an acrid ichor, which is fetid, of a yellowish or greenish black colour, corroding every part with which it comes in contact. The pain is insupportable, and incapable of being relieved by large doses of opium. The lymphatic glands connected with the affected part become swollen and painful, sometimes on the first appearance of cancer, frequently late in the progress of the disease. This is especially observed in cancerous ulcers of the skin, on the face, and in other chronic cancerous affections. The swelling of the glands often gives rise to edema of the parts below them : hence arise the swelling of the arm, the cough, and oppression which takes place in persons with cancerous breasts ; and the edema of the leg, in cases of cancerous testicle.

When a cancerous tumour has attained its greatest size, the patient feels pains extending from the affected part. These arise from the distension of the nerves which pass through the tumour to the painful parts, and are easily distinguished from the peculiar pains of the disease.

The parts adjoining to cancerous ulcers swell, and become absorbed ; sometimes they successively mortify and slough off, so that, in some rare cases, the whole tumour is detached. Notwithstanding this, the disease is prone to return, even before the sore has healed. The constitution at length becomes affected ; fever appears, either after the ulceration, or it is brought on before that period, by the violent and incessant pain. The paroxysms are attended with dry and acrid heat, unaccompanied with sweats. Insomnium, loss of appetite, fetor of the breath, and highly offensive alvine and cutaneous discharges, take place. At length death puts an end to the cruel sufferings of the patient, and most commonly without consumption, or any colliquative symptoms.

The characteristic symptoms of cancer are, the spontaneous developement of a tumour, which is hard, unequal, heavy, and of homogeneous structure, whatever part it may affect, attended with lancinating and burning pains, of a peculiar appearance, and discharging ichorous matter. But these characteristics are by no means peculiar to cancer ; the testicle, for example, in consequence of syphilis or gonorrhœa, becomes hard, heavy, unequal, and the seat of lancinating pains. The surgeon becomes alarmed by a spontaneous ulceration which supervenes, and removes the gland ; but the appearance of the tumour, added to the painful cure of the disease, disproves its cancerous nature. Even the existence of a fatty homogeneous mass is not conclusive evidence of cancer, for the same is found in white-swelling ; a disease,

by the bye, which I am not prepared to say has no analogy to cancer. We must conclude, therefore, that the return of the disease, after extirpation, is the only sign of cancer that is absolutely certain.

Extirpation is the only remedy for cancer; but even this is uncertain. It is effected only when the disease is purely local, as in crustaceous ulcers of the face, the cancerous nature of which is very doubtful. Cancer is generally considered a local disease, when it affects a patient from twenty-five to thirty-six years of age, and has arisen from an external cause; such as pressure, contusion, or a milk abscess. When scirrhus has continued a long time under the form of a small, indolent, moveable tumour; and when the lancinating pains which precede cancer, have been caused by external violence; when these pains are not very troublesome, and of recent date; when there is no swelling of the lymphatic glands; and when, lastly, the skin is sound; under these favourable circumstances, extirpation, it is said, is generally successful. But, under similar circumstances, I have operated in a great number of cases, and many of my patients have had a return of the disease. Almost always the wound has healed; but, in a few instances, the patients have very soon died of irregular and unusual combinations of acute nervous symptoms. My experience leads me to agree with Hippocrates, Celsus, and Monro, that cancer, preceded by scirrhus, always arises from an internal cause, and that a return of the disease is always to be apprehended. The facts in opposition to this principle, stated by Hill, who cured eighty-eight patients, are of little weight, on account of the difficulty of the diagnosis of this disease. I shall only observe, that the cases in which I have operated successfully, have not been attended with swelling of the glands. But how many have died, even when they had not this alarming symptom! I have always remarked, that when, after the operation, and when the wound has begun to heal, fungus shoots up to the level of the skin, of a reddish-brown colour, or sometimes of a pale grey; and sometimes even when a simple spot of one of these colours appears; in such cases, I say, I have ever seen the disease return. Nevertheless, exemption from all these appearances is no surety against a new attack. When, after an operation, the disease recurs, it makes more rapid havoc than before.*

* It appears that this observation was familiar to the ancient physicians. Hippocrates says: "Quibuscumque occulti cancri fiunt, eos non curare melius est; si enim curantur, citius moriuntur; si vero non curentur multum tempus perdurant." Sect. vi. Aphor. xxxvii. If this passage have not

If the success of an operation be doubtful when all circumstances appear favourable, the case is almost without hope if it be of long standing, especially if the tumour be large, unequal, and covered with varices: if it adhere to the subjacent parts; if the skin be puckered, and connected to the upper surface; if there be lancinating pains, and swelling of the lymphatic glands; it is no surety to remove all the decayed glands. There are said to be some rare examples of success, even under these circumstances; but these do not justify us in following the maxim of Celsus, "to employ an uncertain remedy rather than abandon a patient to certain death." A much better rule of practice is, to abstain from every useless and painful operation, when there is no probability of doing good. It would, moreover, seem that there exists a certain relation between a cancer and the state of the constitution. Some future day may perhaps enable us to determine the nature of this relation, and to trace the limits of art.

An operation can never be justified, unless the tumour be perfectly circumscribed, and every diseased part can be removed. Hence it follows, that the treatment of cancer is curative and palliative.

The first consists in the entire destruction of the affected parts, and may be accomplished by caustics, or by the knife.

Different methods of applying caustics have been proposed. Some have advised a piece of caustic potash, or of the white oxyde of arsenic (which has been especially employed), to be applied to the centre of the tumour, and to continue the destruction of the cancer to the circumference. Others have directed the tumour, in the first place, to be isolated by the caustic, and the centre to be destroyed afterwards.

But when the tumour is large, and the caustic is required a number of times, the irritation which follows is dreadful, and is generally succeeded by a return of the disease in a

hitherto produced the effect it should have, it is because that Hippocrates spoke of un ulcerated cancer; then the aphorism is unintelligible. But if we agree that he refers to cancers not from external causes—those whose origins are *occult*, nothing can be more just.

Celsus lays down the same opinion more clearly. "*Quidam ferro adusserunt, quidam scalpello exciderunt, neque ulli unquam medecina proficit. Sed adusta protinus concitata sunt, et increverunt donec occiderent. Excisa etiam post inductam cicatricem, tamen reverterunt, et causam mortis attulerunt. Cum interim plerique nullam vim adhibendo, qua tollere id malum tentent, sed imponendo tantum lenia medicamenta, quæ quasi blandiantur, quominus ad ultimam senectutem perveniant, non prohibentur.*" (Lib. v. cap. xxviii.) A passage in the same author is cited to justify operations for cancer evidently improper, and which, as we see, he altogether disapproved of.

worse form. I saw a gardener, who had a cancer on the lower lip, which had been healed by a quack, who applied caustic repeatedly to the part. Excruciating pain followed, and the patient came to beg me to operate. I did so. The wound healed quickly; but, shortly afterwards, a swelling appeared under the skin, which extended until it proved fatal, by affecting the respiration and deglutition.

Caustic is only admissible in some very small cancerous tumours, such as occasionally appear on the face. Their action should be made to extend somewhat beyond the diseased parts. But, even in these cases, the knife is preferable.

In the extirpation of cancer with the knife, we may preserve the skin if it be sound; but it is very apt to appear so when it is really diseased. It is safest to err on the side of removing more than is necessary.

If we conclude to preserve the skin, we may begin the operation by making a longitudinal, a T like, or a crucial incision, according to circumstances, and then dissect the flaps and remove the tumour. If we wish to remove any portion of skin, it should be included between two semi-elliptic lines. In either case, we are carefully to search for and remove all the diseased parts; we are then to tie all the bleeding vessels as they are opened, and bring the lips of the tumour as near together as we can. But if we are unable to secure all the divided arteries, it is proper to dress the wound with lint, and not endeavour to promote adhesion by the first intention; because, if the hemorrhage returned, we should otherwise be obliged to remove the dressings; whereas, in the latter case, we can stop it by compression.

It is customary, after healing the wound, to establish one or more issues; and although the inutility of these means, in preventing a return of the disease, is perfectly established, a surgeon would lose his reputation were he to neglect them.

As to the palliative treatment of cancer, it consists in the use of a mild diluting diet, with occasional aperients. When the disease is external, opium may be given with great advantage; it may be very conveniently used in the form of ointment, or dissolved in a saturnine lotion. Opium, taken internally, is apt to produce nausea and vomiting, which prevents its long-continued use. The extract of hemlock may moderate the pain, by producing stupor: we ought, however, to remember, that it greatly weakens the stomach. Water, with ice in it, for the patient's only drink, was considered by Pouteau as a specific for cancer.

In tracing the history of cancer, we have proposed some queries concerning its nature; we shall conclude by adding a few more, which will show how much we have yet to learn concerning this disease.

What analogy is there between those superficial and stinging ulcerations of the skin, which are called *superficial cancers*,* *cancerous tubercles of the skin*, *cancerous tumours* in the cellular tissue near to bones, and which destroy them; osteo-sarcoma, properly so called; scirrhus ulcers of the pylorus, pancreas, liver, and valve of the cæcum; ulcerated tubercles of the rectum and uterus, and cancer in the exquisite form, as it appears in the mamma and testis?

What intrinsic and natural connexion is there between an indurated inflammatory tumour, mild scirrhus, and commencing cancer?

Are there any peculiar symptoms to each of these diseases?

How shall we distinguish a tumour kept up by a known virulent cause, from the beginning of genuine cancer?

To what extent may these diseases be combined? what influence do they exercise over one another? and what is the power of art in these cases?

Can cancer affect the constitution, independently of its local action? If so, what is the system of organs it affects? what symptoms does it produce? &c. &c.

Such questions might be multiplied without end. How can any one affirm that he has cured cancer, while we are yet unable to answer to any one of them?

ARTICLE XI.

Of Edema.

Edema is a white, cold, soft, indolent, uncircumscribed tumour, which retains, for a few moments, the impression of the finger, and which is formed by the infiltration of serum, with a small portion of albumen, into the cells of the subcutaneous cellular tissue.

This infiltration sometimes extends to almost all the cellular tissue of the external part of the body; it is then called *anasarca*, or *leucophlegmatia*—a disease which belongs to the class of dropsies, and does not come within the scope of

* See note R.

this work ; but most commonly the infiltration is confined to a part of the subcutaneous cellular tissue.

Partial edema readily appears in persons whose lymphatic system is disordered.

Edema is generally seated in parts remote from the centre of the circulation, and where the cellular tissue is abundant, loose, and connected with little fat ; such as the legs, feet, and hands ; the face and eyelids ; the labia in women, the scrotum and prepuce in men. The disease commences below, and extends upwards.

Erysipelas is sometimes connected with phlegmon ; this has led some authors to distinguish a certain kind of this disease into *hot*, or *erysipelalous*, and *cold edema* ; but, if we consider that erysipelas does not appear until the edema has advanced to a certain height, so as to distend and irritate the skin, or even to rupture it ; that erysipelas is often the consequence of scarifications and punctures made in the skin, in order to discharge the serum ; that erysipelas is then often changed to ringworm.—we shall be convinced that it furnishes no just ground for such distinction.

Edema is idiopathic and symptomatic. The first depends upon a weakened action of the lymphatics, either of the part, or of the whole system.

A lax and feeble constitution, a lymphatic temperament, added to living in a moist and cloudy atmosphere, or in a low marshy situation ; remaining for a long time with the legs in water ; the debility which succeeds long diseases ; copious evacuations, such as excessive hemorrhagies, and drinking cold water when the body is covered with perspiration, are the causes of idiopathic edema. To these we may add whatever mechanically prevents the free circulation of lymph in its vessels ; such as bandages, ligatures, tight clothes, &c. Contusions, sprains, fractures, and luxations, are frequently followed by edema, which is then owing to the debility of the parts, and especially of their absorbent vessels ; and sometimes also to pressure on some one or more of these vessels. The pressure of a large cicatrix may cause edema ; so may the abuse of poultices, long-continued riding, or walking. Edema sometimes appears in growing persons : country girls who work hard, young men of robust constitutions, women after the cessation of the menses, and all persons after the interruption of an habitual evacuation, are subject to edema, from a plethoric state of the system.

Symptomatic edema frequently succeeds to eruptive diseases, and sometimes to violent fits of passion, or hysteria : it is often a symptom of deep-seated abscesses, as of the

lungs, liver, &c. It occurs wherever the lymphatic vessels are compressed: hence it takes place in popliteal aneurism, cancer, congestion of the abdominal viscera, and in pregnant women. Frequently it is symptomatic of hydrothorax, or ascites in their latter stages. The learned Professor Corvisart has taught us, that it is also a symptom of disease of the heart, or large vessels around it.

Edema is not always white: when it is caused by sanguineous plethora, the skin is more or less red.

The impression of the finger is least remarkable, and of shortest duration, when edema is recent.

The edema of pregnant women appears only in the last stage of gestation. Though generally confined to the lower limbs, it sometimes extends over the whole body. It is not a serious disease; it is least so in women who take proper exercise, and do not live too high.

The cause of edema is an infiltration of serum, with a small portion of albumen, into the cellular tissue. When it is recent, the laminae of the cellular tissue are separated from each other: in cases of long standing, the cellular tissue is reduced to shreds; the serum at length penetrates into the lamina of the skin, and shows itself under the cutis. In this case, the wrinkles of the skin are destroyed, and a smooth surface appears.

Idiopathic edema is less serious than symptomatic. This last is absolutely incurable, when it is caused and kept up by a disease which cannot be cured. Edema of the arm, for example, brought on by cancer in the breast and congestion of the axillary glands, is of course irremediable. Recent edema is more easily cured than that which is of long standing: the disease is most difficult of cure, when it retains the impression of a finger for a long time. Chronic edema, in the lower extremities of old people, is incurable, because, independently of the excessive distension of the integuments, there is general atony and cachexia. Edema is most difficult of cure in persons of lymphatic temperament.

In the treatment of idiopathic edema, the first object is to remove its local causes, if there be any. The patient should breathe a dry, pure air, use nourishing food, and good wine, take moderate exercise, and commit no fault in regimen; the edematous part must be kept warm, and, if possible, in a temperature which favours its perspiration. In some cases it is proper to place it in a horizontal, or even somewhat elevated position, in order to favour the return of lymph, and use long-continued dry friction, made very gently from below upward, with a flannel impregnated with the vapour of some

aromatic plant, or dipped in a spirituous liquid. The part may be covered with compresses wet with a decoction of bark and tincture of camphor, or it may be exposed to the vapour of vinegar or spirits. In every case, it is proper to apply a roller, in order to resist the afflux of fluids, to prevent a great relaxation of the cellular tissue, and even to favour the return of its tone, and consequently the absorption of serum. This means is especially useful where repose and a horizontal position cannot be enjoyed, and is the only substitute for them. A man had, for a long time, a doughy swelling of the whole leg, in consequence of a sprain of the foot, which had been treated by an empiric: the swelling had not diminished three months after the accident, notwithstanding the use of tonic applications of every kind, and diuretic and strengthening medicines, because the patient had gone about. I carefully applied a roller, and this simple remedy, with a laced dog's skin stocking, cured the swelling, which, until then, nothing had relieved.

We may second the effect of local applications, if necessary, by aperient and diuretic drinks; sometimes antiscorbutics are employed, united with a preparation of squills. The bowels should be kept open by injections, or the occasional use of mild laxatives. Toward the end, you may give, with advantage, bark and iron; but, in general, these remedies are only useful when edema is combined with a general debility of the lymphatic system.

It will be perceived, that the treatment of edema must be different when it depends on any general cause, such as a sanguineous plethora, and the suppression of any habitual hemorrhage; but these are medical considerations, which do not come within the province of this work.

The cure of symptomatic edema can only be effected by the removal of the disease which causes it; if it exist after that, it may be treated with the local means of which we have spoken.

When edema is general, and has resisted all emrative means, scarifications near the ankles, and even on the internal and lower part of the thighs, have been regarded as very efficacious: they speedily give ease, and, indeed, sometimes produce a cure. But this excessive evacuation often produces a fatal debility; moreover, the scarified parts almost always become affected with erysipelatous inflammation, which, in spite of the most active applications, terminates in gangrene, and ends in the death of the patient. Slight incisions have not the same inconveniences, and are therefore preferred. They are made with the lancet, in the

most shining part of the edema. They may be multiplied at pleasure, because they occasion no pain.

When we judge slight incisions necessary, they are always to be preferred to the application of blisters and caustic, which almost always produce an inflammation that leads to gangrene.

Of the Edema of Puerperal Women.

This is a serous infiltration, preceded and sometimes accompanied by inflammation of the lymphatic glands of the part where it is seated.

This disease rarely affects pregnant women; it most frequently comes on after delivery, between the tenth and fifteenth days; but there is great variety in the period of its attack. It almost always affects the inferior extremities; but there are some cases which seem to prove that the arms are not altogether exempt from it. The two limbs are seldom attacked at the same time, but very often the disease appears in each successively.

We may consider as predisposing causes, an anterior disease, labouring gestation, bad nourishment, an excessive sensibility, sitting up at night, difficult labour, errors in regimen, not nursing, or inconsiderately weaning a child; a lively emotion, excitements of the inguinal and iliac glands, copious sweats, or even the habitual transpiration of the neighbouring parts alone, and the moisture in which these parts are kept at this period.

The action of cold is almost always the exciting cause: hence this disease is rare in hot climates. If we may believe travellers, puerperal diseases are almost unknown in Egypt.

The suppression of the lochia was first considered as the direct cause of this disease, which was afterwards attributed to lacteal metastasis; but these circumstances are accidental, and by no means the causes of the disease. It seems to be more reasonably attributed to an irritation of the lymphatic glands and vessels, which produces an afflux of lymph to these parts, or a deficient absorption. A woman, who has been exposed to cold, and who is about to have this disease, suddenly experiences general uneasiness, irregular chills, pain and sense of weight in one of the iliac fossa, numbness in the thigh of the same side, with pain and inflammation of the inguinal glands. In some rare cases, the disease goes no further; more commonly, it quickly extends along the thigh, and there appears on its internal side, in the direction of the principal lymphatic vessels, a painful knotted

cord, of a red colour. At this time, for the most part, the lochia are suppressed, the breasts sink, their secretion ceases, and fever appears, very frequently under the disguise of an intermittent or remittent fever, with exacerbation in the evening. However, in women whose constitutions are not irritable, and in whom the disease is slight, fever does not take place. The pain is augmented by extension, and diminished by flexion, of the thighs and legs: hence patients are almost always in this position. Sometimes the pain prevents every kind of motion of the limb.

Generally, after the two first days, the pain diminishes, and the infiltration commences. It begins in the thigh, with tension and inflammation, which extends like a cord along its internal side; the limb becomes round, and flexion of the knee impossible. In thirty-six or forty-eight hours the pain and inflammatory tension diminish in the leg, and infiltration succeeds. The same phenomena follow, in the same order, in the foot. The edema which occurs, retains the impression of the finger only for a very short time. This circumstance, and the history of the case, leave no danger of our confounding this disease with any other.

The inflammation of the cellular tissue is sometimes so severe as to cause abscesses, which, however, do not open spontaneously, because the skin is not sufficiently inflamed. The matter is sero-purulent, like that which is formed in the chest or abdomen, in consequence of the inflammation of the pleura or peritoneum. Sometimes it is infiltrated into the cellular tissue, or into a greater or less number of small cavities; at other times, it forms extensive collections, which extend over the greater part of the limb, and destroy the skin to a considerable extent. In some patients, however, the disease proceeds no further than the inflammatory symptoms we mentioned, and no edema takes place. When inflammation and infiltration alone occur, the disease may be cured in a few weeks; if, however, abscess be formed, the patient's life is in danger.

In the commencement of the disease, the patient should be kept warm, and take diaphoretic drinks; enemata should be given, and the legs placed in very hot water; fumigations may be employed, and leeches applied to the labia; good effects may also be derived from a vapour-bath;* the nipples should be irritated at the same time, either by offer-

* M. Chaussier has introduced into the hospital de la Maternité a very ingenious process, that consists in introducing under the bed-clothes, which are raised from the body of the patient, a tube, communicating with a boiler.

ing them to the child, or by applying a nipple-glass. Gentle warm frictions with flannel, embued with olive-oil, should then be made on the affected parts: or they may be covered with emollient poultices, or relaxing fomentations.

Bleeding, which has been proposed by some practitioners, should be employed with great reserve. We believe it is rarely indicated, and very apt to be followed by alarming debility. Emetics are extremely useful; they produce the most happy effects whenever there are any symptoms of disorder of the primæ viæ. Vomiting may be useful in the commencement of the disease, by the general shock it imparts to the system, by the perspiration which follows it, and by the activity it communicates to the lymphatics.

When the pain is dissipated, and edema has come on, resolvent applications, and aromatic fomentations, may be useful; diuretics, mild purgatives, aperient drinks, charged with the acetite or sulphate of potash, are also indicated. When the infiltration is considerable, and it resists these remedies, preparations of squills, stimulants, tonics, bark, and rhubarb, are proper.

When abscesses are formed, and fluctuation is evident, the necessary openings must be made, and expulsive compression employed, after the matter is evacuated; it is of the utmost importance, at the same time, to support the patient's strength.

From what has been observed, we may know what value to set upon the pretended specifics for preventing the disease: all of them, except Weiss's whey, are merely evacuants. The only means of preventing this disease, is to keep the mother in a warm equable temperature, and to avoid inconsiderately removing the bed-clothes from over her. But these precautions are not always sufficient.

ARTICLE XII.

Of Wens.

Wens are circumscribed, indolent tumours, seated in the subcutaneous cellular tissue, formed by a substance more or less consistent, contained in a proper sac, or in several cells of the cellular membrane.

These tumours have never been seen, except in the cellular tissue. Though tumours resembling them appear sometimes in the interior of a limb or viscus, they are of different structure, and are formed of very different substances.

Except the lips, where the cellular tissue is very spare, the palm of the hand, the sole of the foot, and the male genitals, there is no part of the body where wens are not occasionally seen; they are even met with in the substance of the labia and mons veneris.

Sometimes several occur on the same patient: in such cases, they are seldom large. A single wen sometimes attains a moderate size, and afterwards remains stationary; but generally, when there is only one, it becomes large. A wen has been known to weigh thirty or forty pounds.

The form of wens is various; but generally they are spherical. They are often conical, with a broad base; sometimes they are pyriform, or have a large base, with several depressions: whence they have been called *testudo* and *talpa*, from their resemblance to these animals.

Many wens are formed of a sac below the skin, containing matter; in other cases, the matter is contained in several small cells: hence the divisions of wens into *encysted* and those that are *not encysted*.

The matter contained in the cyst is sometimes limpid and serous, forming an hydropic encysted tumour; sometimes it is laetescens, or sanguineous; but most commonly the matter is yellow, viscid, and of the consistence of honey; or of a greyish-white colour, and grumous. The former is called *meliceris*, the latter *atheroma*. In a few instances, hairs have been found in the cyst, sometimes adhering to the inside of it, sometimes free, and floating in the matter.

Among wens which have no cyst, some are formed of disorganized fat, which has lost its natural colour, and become white and hard; it is contained in the distended cellules of the cellular tissue, and mixed with serum: these are called *scatomata*. Others are formed of fat which preserves its natural colour, and nearly its natural consistence: these are termed *lipomata*.

Louis and others have asserted, that the distinction admitted by Littre, between lipoma and scatoma, was not natural, and that these tumours did not differ from each other. But the matter they contain is not the same, nor their diagnostic signs; and, what is still more important, scatoma alone sometimes terminates in cancer.

The cyst of wens presents an external convex surface, more or less united to the adjacent parts; an internal concave surface, in contact with the enclosed matter, equable, and not unlike serous membranes which have been affected with inflammation. The thickness of the sac is greater in atheroma than in meliceris; but, generally, it is in propor-

tion to the size and age of the tumour. The cyst is formed of lamina of cellular tissue, the internal layers of which are more intimately connected together than the external. As to the matter contained in meliceris and atheroma, it is difficult to say what it is ; there is, however, a striking analogy between it and what chemists call *fat*.

In steatoma and lipoma we find, immediately below the skin, a cellular tissue, the areolæ of which are distended, and converted into cellules, the size of which is sometimes very great when the tumour is large. These cellules, containing degenerated fat, or fat in its natural state, are connected by cellular tissue of a different nature, containing a peculiar fluid, and which is simply moistened by the ordinary lymphatic perspiration. According to Morgagni, if we open a steatoma or lipoma longitudinally, we find the cellules ranged in parallel lines, and subdividing the tumour like vessels. If they be cut at the base or at the pedicle, perpendicularly to the axis, and at different parts of their length, we see these cellules more compact in the pedicle, and gradually larger as we approach the base : at this part we may also see the continuity of the sound cellular tissue with that which constitutes the diseased part, and judge of the differences between them.

We have already remarked, that the matter contained in steatoma and lipoma is fat ; more abundant and more consistent than natural in the former ; and white, firm, disorganized, and mixed with lymph, in a greater or less degree, in the second. It is also observed, that steatoma is apt to degenerate into cancer, in proportion to the relative quantity of lymph it contains.

An opinion, which the present state of our knowledge does not now permit us to entertain, attributed the formation of wens to a disease of some pretended glands under the skin : it was supposed that the obliteration of their excretory ducts gave rise to a distension of their sides, which thus became the sides of a cyst ; and that the matter contained in the tumour was the product of secretion, altered by remaining in the sac. In the first place, it will be remarked that this theory applies only to encysted tumours ; and, in the second place, the pretended glands have no existence. We may observe also, that diseases of the cutaneous mucous follicles are situated in the thickness of the skin, and near its external surface ; and are very different from wens, as we shall see hereafter. Lastly, Morgagni has proved the cellular nature of the cysts, and the cellular texture of steatoma and lipoma. It is much more probable

that the alteration of the natural secretion of one or more areolæ of the cellular tissue, and their distension by the accumulation of secreted matter, is the true cause of the formation of wens, whether encysted or not so; but it is not known whether the secretion receives its characters from the state of the solids, or is itself the cause of the change they undergo. How shall we explain the singular formation of hairs? Are there always bulbs in the sides of the sac? Are these bulbs merely those of the skin turned inwards? And, lastly, how are all these circumstances to be explained?

Without endeavouring to solve these problems, we shall observe, that, when an old steatoma is about to become scirrhus and cancerous, it gradually becomes harder, unequal; the fatty lobes are confounded, and, on cutting open the tumour, we discover only a fatty homogeneous substance, as in cancer from other causes.

After a blow, a fall, or long-continued pressure, an encysted tumour sometimes appears on the kneecap, or olecranon; it is seated in the cellular tissue, and contains a fluid less consistent than that of wens, and resembling that synovial substance which lubricates the pulleys of tendons.

The developement of wens is commonly spontaneous; they seem, however, to be sometimes produced by external violence.

They appear in the form of globular or oblong tumours, without change in the colour of the skin; they roll under the finger, and are more moveable than other tumours. Sometimes they grow rapidly, and adhere to the skin; but more commonly they increase very slowly, or remain stationary.

In meliceris, the tumour is soft, elastic, and fluctuating; in atheroma, it is less elastic, and more doughy. But these characteristics are not generally strong enough to enable us to determine the exact nature of the contents, until we open the tumour.

In steatoma we can distinguish several lobes and intervals between them; lipoma, on the other hand, is smooth, soft, frequently large, and conveying a sensation such as resembles that derived from feeling a sponge.

Notwithstanding these general and specific signs, it is sometimes difficult to distinguish wens from scirrhus tumours.

A wen is not generally dangerous; it becomes so only by injuring some important function, or by its extraordinary magnitude.

A sailor had a very large wen, weighing nine or ten pounds, on the external part of the arm: Desault extirpated it. The man did well for some time; but the suppuration at length became excessive, and he died.

Meliceris and atheroma are always less dangerous than steatoma, because they never grow so large, and never terminate in cancer.

The treatment of wens has for its object, either to discuss them by resolvent applications, to make them suppurate by exciting irritation, or to extirpate them by caustics, ligature, or an operation.

Resolution is always desirable, but seldom attainable; however, in the encysted tumours which appear on the patella, resolution sometimes takes place spontaneously, and may be effected by proper applications. These tumours have a large base, and are formed of a thin cyst, containing, as we have said, viscous, limpid matter, and seeming to adhere to the bone; they may sometimes be discussed by the muriate of ammonia, &c. The ancients employed dry cupping and frictions; Louis has proposed fumigations with vinegar, holding gum ammoniac in solution. They have been cured by an accidental rupture. Perhaps it might be well sometimes to break them by a blow. I have cured, by applying the muriate of ammonia, two tumours of this kind on the kneepan; one on a lady, as large as a hen's egg; another on a young man sent to me by M. Pinel, which was still larger.

When these means fail, we may puncture the tumour, let out its contents, and keep the sides of the sac together by compression. The cavity has been often obliterated in this manner.

If this process do not answer, we may treat the tumour like an hydrocele. In a case of this nature, where I had unsuccessfully tried a weak injection, I afterwards succeeded by using warm wine. It is sometimes necessary to employ alkohol, or a solution of caustic potash.

Might not warm wine be used in recent meliceris, or atheroma, which is rapidly enlarging? M. Chopart, who has written an excellent memoir on this subject, succeeded in curing, in this way, wens on the face; Valsalva and Morgagni discussed wens on the eyebrows and face, by continued applications of elder water and liquid ammonia; and many others have had similar success with a plaster. Resolution is especially desirable in these cases, on account of the scars which follow the operation; but it takes place very slowly, and not until the plasters of hemlock or soap which are employed, inflame and irritate the skin.

Wens sometimes spontaneously suppurate, open on their summits, and discharge matter, at first laudable, then ichorous and fetid; at the same time the opening remains fistulous. Occasionally the cyst is separated from the surrounding parts, and discharged with the matter; but this rarely takes place, and cannot be effected by art. However, when we see the disease tending to this termination, we should promote it by irritating applications.

In the application of caustics to meliceris, we should cover the tumour with a diachylon plaster, with a hole in it proportioned to the eschar which we wish to form; over this opening is to be placed a piece of caustic potash, surrounded by lint, and the hole covered by a second plaster. After four hours, the action of the caustic will have ceased; and when the eschar separates, the cyst will be opened, and its contents let out. The remainder of the sac should be cauterized, on its internal surface, with the liquid muriate of antimony, caustic potash, or sulphuric acid. A dossil of lint is to be moistened with one of these caustics, and drawn over the surface of the cyst: in this way the sac sloughs off, and granulations appear in its place, which subsequently adhere to each other.

This mode of treating wens by caustic, although painful, is generally preferred by patients, and may be adopted, when the situation and size of the tumour admit of its application; but it must be recollected, that it leaves a large cicatrix, and the knife is much more manageable and certain; moreover, if the cyst be thick and hard, it may become cancerous by repeated cauterization, as I have once seen. It is not applicable to steatoma; as to lipoma, it has been said that, after having removed the skin by caustic, it was sufficient to place, from time to time, a few grains of caustic potash on the fatty mass, to cause it to mortify; but this method is uncertain and tedious.

It has been proposed to intercept, by ligature, the communication between the tumour and the body. This method, of course, is applicable only to pyriform tumours, and not at all to meliceris or atheroma. In order to avoid the severe pain occasioned by the ligature, we should disorganize the skin over which it is applied, by dipping the first ligature into a solution of caustic potash. This should be removed in four or five hours, and the eschar divided. The application of a second ligature, which acts on the cellular tissue, causes very little pain, the tumour soon separates, and the wound it leaves quickly heals.

M. ——— had a tumour, as large as his fist, on the upper

and internal part of his thigh, which prevented him from riding on horseback. He would not suffer an operation, and I cured him in the manner I have mentioned.

The extirpation or amputation of wens is the surest means of curing them. In the former, the tumour is removed, but the skin over it preserved; in the latter, both skin and tumour are removed. Extirpation is to be preferred to amputation, except where the skin is diseased, and adheres to the tumour.

When the tumour is small, it is sufficient to divide it longitudinally, and separate the lips of the wound, so as to dissect out the cyst. After this process, the parts may be immediately united.

When the tumour is too large to be insulated by a single incision, we may make two in the shape of a T, or thus +, dissecting up the flaps, and re-applying them after the tumour is removed.

When we are operating on a meliceris or atheroma, we must be careful not to cut through the cyst, which would thus become relaxed, and render the operation tedious. If, however, this accident do happen, as it sometimes does, from using a blunt instrument, we should endeavour to pull away the cyst; but if its attachments be too strong, it must be dissected out as well as the case will allow.

When the cyst adheres to a large vessel or tendon, or is connected with a joint, we must content ourselves with removing part of it, and lapping the flaps of the wound on the remaining part, by which we generally procure speedy adhesion.

A priest had an encysted tumour on the bend of the knee: I made a crucial incision, and, after dissecting back the flaps, I found it adhered to the important parts below. I therefore removed only the projecting part of the cyst; the flaps were re-applied, and the cure was complete in fifteen days. In a similar case, Chopart covered with lint the part of the sac left behind, which became dry, and took the place of the integuments that had been cut away. Generally, the portion of cyst left behind, inflames and suppurates; and, if the skin be not preserved, the cure is tedious. All the sound skin should, therefore, be spared, and that which we intend to remove, be included between two () semi-elliptical incisions.

We shall conclude this article, by some observations on a particular affection of the follicles of the skin. The secretion of the sebaceous glands of these small sacs sometimes becomes very abundant, and more consistent than natural.

This disease takes place especially in the face and neck. The presence of the sebaceous humour accumulated in the follicles, distends them, thickens their sides, and gives rise to a genuine encysted tumour. On the other hand, the sac cannot be distended, without its opening to the skin being enlarged; but the matter is too thick to be discharged; that part of the humour next the air becomes dry and black, appearing externally about the size of a grain of gunpowder. If the tumour be compressed, a cylinder of fatty matter escapes.

At a more advanced period, the apex of the tumour flattens, and the opening of the follicle disappears; a broad, flat, doughy tumour is formed, which adheres to the skin, and appears identical with it, but free from the parts below. There is a regular circular opening in the centre, with thin edges, without inflammation or ulceration, and filled up with brown matter. If this matter be detached, and the tumour compressed, a yellowish or fawn-coloured matter is expressed, more consistent than lard. When, by repeated compression, the tumour is entirely evacuated, we see the red sides of the cyst. The little tumours are entirely free from any serious consequences; however, they give rise to some degree of deformity. The method of healing them is, to tear out the cysts, or to inflame their internal side. The former is the most sure and expeditious plan of cure.

CHAPTER VIII.

Of Ulcers.

ARTICLE I.

Of Ulcers in general.

ULCKER is a solution of continuity of the soft parts, accompanied by a flow of purulent matter, and continued by a local disease, or an internal cause.

Most authors and practitioners confound ulcers with simple suppurating wounds; but the difference is striking; for, in the former, inflammation, suppuration, the draining and cicatrization, succeed each other in regular order, and nature accomplishes a cure by her own efforts, more or less assisted by art. In the latter, on the contrary, the healing powers of nature are small or insufficient, or perhaps tend only to aggravate the disease: all of which circumstances arise from a local or general disease.

Ulcers may not only affect any part of the external surface of the body, but even its internal surfaces, with which air or other external agents come in contact. We shall speak at present, however, only of the former.

Ulcers most frequently affect the lower extremities, owing to the relative debility brought on by the constant exercise of these limbs, either by the irritation it excites, or the difficult circulation in the parts. The form of ulcers is sometimes very irregular, sometimes oblong, sometimes circular: their edges are thin, elevated, more or less hard, and sometimes even turned back: in different circumstances, we judge from these phenomena of the cause by which the ulcer is kept up. The round form of an ulcer renders it more difficult of cure. The reason of this may be readily conceived, if we recollect that the cure of a suppurating wound depends principally upon the sinking of its borders, and their mutual approximation; moreover, round ulcers are generally kept up by an internal cause, and are often attended with loss of substance: hence their cure depends less on the sinking of their sides, than upon the desiccation of their surfaces. The causes of ulcers are internal or external; sometimes both act together.

Experience has taught us, that among the internal causes,

we should reckon the venereal, herpetic, and serofulous virus, scurvy and cancer. These ulcers derive their names from their internal causes. Certain ulcerations are met with, that are kept up by an undefined constitutional disease, which are very difficult to cure, because the nature of the virus being unknown, we can form no positive indication. In these equivocal cases we often succeed by what are called alterative and cleansing medicines. We should also add to the number of internal diseases of which we are speaking, the obstacles which may arise from the age of the patient, his temperament, his profession, mode of living, and the climate which he inhabits.

The external or local causes which prevent ulcers from healing, are numerous and various. Sometimes the skin about the edges of the ulcer is detached, thin, deprived of cellular tissue, and in a manner disorganized: this is called a *cutaneous ulcer*. Sometimes the whole ulcer, or its edges only, are habitually inflamed; it is then called an *ulcer with inflammation*. Sometimes the cellular tissue of the bottom and edges of the ulcer become hard and callous, forming what is called a *callous ulcer*. At other times the veins of the limb, or about the ulcer, are preternaturally dilated: this constitutes the *varicose ulcer*, which is often complicated with the preceding. Some are kept up by the extraordinary puffiness, or fungous state of the granulations: these are termed *fungous ulcers*, which must be distinguished from *carious ulcers*, and ulcers with disease of a cartilage, tendon, or aponeurosis, of which fungus is but a symptom. Others are continued by the larva of insects, the eggs of which have been deposited there: these are called *verminous ulcers*. Can we class among ulcers kept up by a local cause, ulcers of the face, known by the name of *chancre*? Are there any well authenticated examples of ulcers of this kind having been cured, and the healing of which has been followed by symptoms that proved their connexion with an internal cause? Although there is great probability in favour of the first opinion, these questions are far from being satisfactorily determined. The same may be said of ulcers kept up by a local indeterminate disease, and which can only be cured by destroying the whole ulcerated surface by caustic. Lastly, foreign bodies may prevent an ulcer from healing, but then it becomes fistulous, and this is not the place to treat of such cases.

Beside the species we have enumerated, we must add the *gangrenous ulcer*, whether the gangrene result from inflammation produced by an external cause, or arise from a sudden

deposition of a deleterious principle, which is spread through the animal economy. In these two cases, the colour and nature of the suppuration, and the appearance of the ulcer, are changed, and the latter assumes a hideous and disgusting aspect. In order to understand the influence which the general or local causes just enumerated exercise over ulcers, we must refer to the principles we laid down when speaking of simple and suppurating wounds. We have shown that the inflammatory swelling of the edges gives rise to an appearance of loss of substance much greater than it really is; we have shown that the sinking of these edges, and the slight tumefaction of the bottom, almost levelled the whole surface, and placed the parts nearly in the same situation as they were before the solution of continuity. But still a small extent remains, on which the skin does not advance, and in this part alone a true cicatrix is formed. All that we know of the mechanism of this process is, that the granulations which form that part of the bottom of the wound over which the skin cannot extend, becomes covered with a membranous pellicle, which connects them together, dries, becomes organized, and takes the place of the natural integuments. Analogy would lead us to believe that the pellicle is formed by the albumen, which also connects inflamed parts together. It is probable that an essential condition of the formation of cicatrices is, the reduction of inflammation to that degree in which cellular tissue, developed in the form of granulations, secretes perspiration instead of pus.

Commonly ulcers that depend upon a general or internal cause, are spontaneous, and accompanied by phenomena proper to each cause that may occasion them, which we shall describe when treating of each particular kind. Those, on the contrary, that are occasioned by a local or external cause, are always continued by a cause different from that which first produced them. Thus they frequently succeed an abscess, or an accidental solution of continuity.

Ulcers are more or less difficult of cure, according to circumstances. 1st. Ulcers on the legs are more difficult to cure than those of the arms, on account of the frequent and painful exercise of the first, and the difficulty of circulation they experience. 2d. Those in parts where the skin is furnished with but little cellular tissue, and in a constant state of tension, are difficult to heal, on account of the small advantage they receive from the flattening and draining of the edges: such is the case with ulcers on the internal sides of the tibia, and opposite the angle of this bone. 3d. For the same reason, ulcers with loss of substance heal slowly, and with

difficulty. 4th. Ulcers that depend on an internal cause are the more dangerous, as that cause is unknown, or we have fewer means of remedying it. 5th. Those even that depend upon a known internal cause, and for the destruction of which art possesses efficacious means, may be difficult of cure, and even become incurable, if the constitution be seriously affected. 6th. Among local causes that support ulcers, some are easy to remove, such as inflammation; others more difficult to destroy, as callosity, &c. 7th. Recent ulcers are more easily cured than ancient ones, and ulcers on young persons easier than on those who are old.

The idea that ulcers are habitual drains, has frequently occasioned the question to be discussed, whether there are not some which it would be dangerous to cure? But if ulcers depend on an internal or external cause that can be removed by art, what danger can result from cicatrizing them? There can be no other than the sudden suppression of an habitual evacuation, become important, not in relation to the quality of matter evacuated, but from the disposition to produce it, which the vital force has for a long time acquired. It is then a function, which, from the time it has existed, and the force of habit, has become essential to health, and may be dangerous to suppress without proper precaution. But, in this case, habit may be changed by a nourishing regimen, repeated purgatives, and, if necessary, an issue, which may be dried after a certain time. But the constitution must be able to support these means; and it would not, therefore, be prudent to cure an ancient ulcer that has furnished abundant suppuration, in very old persons.

The general indication relative to the cure of ulcers, consists in destroying their particular causes, whether external or internal; and, after having reduced them to simple running sores, they are to be treated as such. In speaking of the different kinds of ulcers, we shall lay down the proper treatment of each; and to render this as clear as possible, we shall commence with the most simple cases, or ulcers from local causes. But, previous to going into a detail of the different sorts of ulcers, we shall make a general observation relative to their treatment; we shall see that compression has been acknowledged as efficacious in the cure of varicose ulcers, and that it has been successively proposed for other sorts; but experience has proved that it is not useful in all cases.

ARTICLE II.

*Of Ulcers continued by a local Cause.*SECT. I. *Of Cutaneous Ulcers.*

When an inflammatory tumour appears in the subcutaneous cellular tissue, if the inflammation proceed to suppuration, as in exquisite phlegmon, the cellular tissue is pushed out by the purulent collection, and not destroyed except in a very small part; the inflammation extends from the central point, and a spontaneous opening takes place; the discharge of pus allows the cellular tissue to fall together, and obliterate the purulent cavity. All this takes place in a few days, and cicatrization follows, leaving no appearance of loss of substance. But when the abscess is accompanied with little inflammation, and of that kind called *cold*, which is particularly observable in scrofulous patients, or in persons of a weak lymphatic system, the pus forms slowly, and all the subcutaneous cellular tissue is destroyed; the skin is thinned, and, before the opening of the abscess, or after it, a certain extent of this membrane mortifies; at the same time the cellular tissue is so relaxed and debilitated that cicatrization cannot take place. This disposition of the parts alone is sufficient to prevent the sore from healing, and constitutes what we term a *cutaneous ulcer*.

A cutaneous ulcer may also result from a large abscess, attended with violent inflammation and mortification of the cellular tissue, or from a severe external injury.

This sort of ulcer is easily known. A cold abscess, which has opened of itself, or that has been opened after the purulent matter has remained a long time, is an indication of the existence of a cutaneous ulcer. On the other hand, a small ulcer, covered with a brown or violet thin loose skin, with a rough edge, and under which a probe may be easily passed, leaves no doubt of its being continued by a disease of the skin. To distinguish it from a fistula, it is sufficient to consider the nature of the part in which it is situated, to ascertain if a probe may be passed in one direction only, and to compare the quantity of pus with the apparent extent of the ulcer.

While matters remain in this state, cicatrization cannot take place. There are two different sorts of ulcers, each of which requires a different treatment: in the first, the skin around the ulcer is not entirely deprived of its cellular tissue, but its want of action prevents it from uniting to the

granulations below ; in the second, the subcutaneous cellular tissue is entirely destroyed, and the thin, brown, and disorganized skin is incapable of being irritated sufficiently to unite. In this first case we may derive benefit from compression, provided inflammation have been previously excited by dry lint, the green balsam of Metz, or the nitrate of silver ; in the second case, it is necessary first to cut away the thin skin, and then excite inflammation in the large and bloated granulations, by the nitrate of silver.

A young lady, of delicate constitution, and of a scrofulous habit, had a cold abscess under the right ear : it was improperly left unopened two months. When I was called to see her, I found a considerable collection of pus under the skin, which was thin to a great extent, and of a brownish-red colour. I made a longitudinal incision on the edge of the thin skin, and introduced into the opening a piece of nitrate of silver, with which I touched the under side of the skin and the bottom of the ulcer. When the eschar formed by the caustic came away, I made a slight compression, which produced adhesion of the skin in part : the thin skin I found it necessary to remove by caustic. The ulcer soon healed, and the cicatrix was not large.

Before the cicatrization was complete, another abscess appeared at the lower part of the neck. As soon as the fluctuation was perceptible, I made a small opening in the centre of the tumour, and evacuated the pus. The skin not having become thin, the cicatrization took place without any deformity.

Mademoiselle de C —, aged eighteen years, of a strong constitution, enjoying good health, run a thorn into the sole of her foot, not being removed, it caused an abscess, which did not open for a long time, on account of the thickness of the skin in this part. The integuments having been detached, and deprived of their cellular tissue, a cutaneous ulcer ensued, which was wrongly considered to be kept up by an internal cause. I cut off all the detached skin, and the patient was cured in twenty days.

SECT. II. *Of Ulcers kept up by Inflammation.*

Too much and too little inflammation are alike obstacles to the healing of ulcers ; the first obstacle is a very common one, and may arise from external and internal causes ; the contact of air alone is a cause of irritation in sores where a solution of continuity of the skin has exposed the parts to its action ;—our dressings are more or less irritating. Exer-

eise, and frequent movement of the affected part, may also be placed among the internal causes of inflammation. Ulcers on the legs are most common among labouring people, who always inflame a small scratch into an ulcer. The habit of keeping the limb in one position is of itself sufficient to obstruct the circulation, and produce inflammation of a wound: this is another reason of the frequency of ulcers on the legs.

Disorder of the *primæ viæ* is a frequent cause of inflammation in wounds and ulcers, and this we observe among persons who are badly nourished, or who labour beyond their strength, as well as among patients in a crowded hospital. To these causes of derangement of the first passages we may add excess of every kind, especially in the use of spirituous liquors.

When an ulcer is inflamed, its surface and edges are of a deep red, partaking of the brown; the pus is scanty, serous, ichorous, and bloody; the ulcer is extremely sensible, and painful to the touch: it bleeds upon the slightest contact. When it has continued for some time, these phenomena are much less strongly marked; its surface becomes hard, the pus of bad quality, and fetid. On account of its disagreeable appearance, the ancients called it *sordid*. Inflammation, which depends upon disorder of the first passages, may be readily distinguished from any other by the extension of the erysipelatous redness to the surrounding parts. Inflammation produced by any other cause is almost entirely confined to the ulcer itself.

In the treatment of inflammatory ulcers, the quantity of food must be diminished in proportion to the strength of the patient and the violence of the inflammation. He must use cooling and acidulous drinks, and be kept perfectly quiet, with the affected part in a horizontal position. If the patient be young and plethoric, and the inflammation very intense, a bleeding may be proper; if there be symptoms of derangement of the first passages, an emetic and mild purges must certainly be given. Emollient poultices must be applied until the sensibility of the sore is diminished, the pus more copious, and of better quality, and the edges of the ulcer sink, and its bottom becomes covered with firm and consistent granulations. The further use of poultices would relax the granulations, and render them spongy: dry lint is then to be applied.

SECT. III. *Of Gangrenous Ulcers.*

If any cause give rise to severe inflammation in an ulcer, and if its suppuration be totally suppressed, gangrene supervenes.

But we see patients of good constitution, who are predisposed to gangrene from very slight causes. In such persons, an old ulcer, or a recent wound, without any apparent cause, is suddenly affected with violent inflammation and gangrene, which sometimes makes rapid progress.

There is no difficulty in distinguishing these two kinds of mortification. In one case, it is easy to discover the local or general causes which have converted healthy inflammation into gangrene; and, in the other case, besides the absence of these causes, we never fail to witness typhoid symptoms, which indicate the pernicious nature of the inflammation, the presence of a deleterious principle, and the efforts of nature to throw it off.

Persons exposed to gangrenous ulcers, strictly so called, are generally feeble, either from their natural constitutions, or from previous disease; but sometimes they are apparently well, in high health, and in all the strength of youth. The parts about the ulcer first become red, brown, or violet; the general symptoms appear; the wound is covered with a black eschar, which enlarges; the prostration of strength, the smallness and irregularity of the pulse, and the stupor and delirium which sometimes supervene, do not abate until the deleterious principle is entirely deposited on the affected part; the mortified eschar then becomes detached. Malignant gangrene, affecting an ulcer, is far more serious than that which succeeds violent inflammation; the latter requires repose, horizontal posture, the antiphlogistic regimen, and emollient applications; and is often reduced, with surprising rapidity, to the state of a simple sore.

But it is very different with gangrenous ulcers, properly so called. In this case, as in carbuncle, the whole indication is to support the strength, and to aid nature in casting off the sloughs. Bleeding and cooling drinks are rarely admissible; on the contrary, bitters, and especially bark, are imperiously called for: camphire and the anti-scorbutics may be highly useful. The local treatment must be exactly conformed to the treatment of malignant gangrene. Severe pain sometimes precedes the development of mortification; we should commit a great fault, if we gave opium with a view of moderat-

ing them ; the prostration of strength would be increased ; even its use externally requires circumspection.

When the eschars are detached, the ulcers become simple wounds.

SECT. IV. *Of Callous Ulcers.*

The bottom of callous ulcers, their edges, and the parts about them, are habitually in a state of chronic inflammation.

These ulcers are very common among the lower class of people : they result from neglect of some slight injury ; and are especially common on the legs. The hardness of these sores is the result of chronic inflammation, and is generally in proportion to the time which the inflammation has excited.

Exercise, errors in diet, and irritating applications, may change a simple sore into an inflammatory ulcer. A continuance of similar causes renders it callous. These ulcers are often complicated with varicose veins.

The surface of a callous ulcer is generally pale, or of a dirty red ; its edges are turned back, and the adjacent skin is of a slight red. It is not painful. It discharges a serous, sanious, or bloody and fetid pus.

These ulcers are rather more difficult to cure than inflammatory ulcers ; and when they do heal, the cicatrix is so thin that it easily opens again. Before the complete cicatrization of a callous ulcer it is proper to open a drain in some other part.

The treatment consists in keeping the limb perfectly still, covering the sore with a simple digestive, and the adjacent parts with a poultice, avoiding, at the same time, every source of irritation. The ulcer quickly softens, its surface becomes moistened with healthy pus, its edges thin and pliable, red and firm granulations cover its bottom, and cicatrization advances rapidly. It soon becomes necessary to substitute dry lint for the digestive ; but the poultice must be continued until every vestige of hardness has disappeared.

Compression, from which so much benefit is derived in varicose ulcers,* is not a proper remedy in these cases. After the cure, however, it is useful in preventing a relapse.

* See note S.

SECTION V. *Of Varicose Ulcers.*

This term is applied to ulcers which are continued by a varicose dilatation of the veins of the part, and especially the lymphatic or doughy congestion to which it gives rise. The pressure of the enlarged veins on the lymphatics, causes the edema. The edema prevents the sinking of the edges of the sore, and thus hinders it from healing. If, however, the varices do not occasion a lymphatic congestion, they do not interfere with the process of cicatrization. In the other case, the distension creates a constant irritation.

Varicose ulcers are livid at the bottom, brown on the edges; they furnish a serous and bloody pus. They are often combined with callous ulcers, and their appearance then partakes of the characteristics of both. They are easily cured, but very liable to return, unless suitable precautions be taken. Compression is a very necessary and effectual part of the treatment: it promotes the absorption of lymph, relieves the skin from its tension, and promotes the sinking and approximation of the edges of the ulcer; while, at the same time, it disposes the dilated veins to contract. Thus the ulcer is rendered simple, and its cure easy. The ulcer is to be covered with dry lint, and its edges with strips of linen spread over with cerate. Compression is then to be made by a roller, or laced stocking: the former, however, does not act equally on every part; and the latter, especially if made of strong linen, is preferable. It is necessary to keep the limb at rest, until the cicatrization is complete. The laced stocking must be worn for some time afterwards.

This treatment is always successful in simple varicose ulcers; but if the sore be callous or inflamed, it would be injurious, unless it were preceded by the use of relaxing applications.

SECTION VI. *Of Fungous Ulcers.*

This term is applied to ulcers kept up by the atony and bloated state of the granulations which cover it. They rise above the surface of the wound, sometimes forming a tumour, which is connected only by a pedicle, and prevents the ulcer from healing. The want of vital action in the vessels, is another obstacle to its cicatrization.

There are three causes of this state of ulcers. 1st. The abuse of unctuous applications. 2d. A general debility.

3d. Caries, or mortification of a tendon or aponeurosis, corresponding to the ulcer.

When the first of these causes has produced the evil, we should excite a slight degree of inflammation in the part by the use of lime water and similar applications. If these means be insufficient, we may sprinkle on it burnt alum, or touch it with the nitrate of silver. If there be a fungous tumour hanging by a pedicle, it is best to cut it off. Faure recommends applying a red hot iron, or burning coal, near to the ulcer. This may be a useful remedy.

But if the fungous state of the ulcer arise from a weak lymphatic constitution, it is necessary, at the same time, to employ tonics, and other appropriate remedies.

We shall hereafter speak of the third class of fungous ulcers, which is connected with caries of a tendon or bone; observing, however, that those tumours which are called *hypersarcomas*, which are exquisitely sensible and large, and which commonly appear in cancerous constitutions, are injured by irritating applications.

SECTION VII. *Of Verminous Ulcers.*

This term has been improperly applied to ulcers in which insects are generated. This arises altogether from the use of unclean dressings: of course, the irritation which the animals excite, prevents the wound from healing. The animals are easily destroyed by mercurial ointment; afterwards, attention to cleanliness alone is necessary.

ARTICLE III.

Of Ulcers continued by an internal Cause.

SECTION I. *Of Venereal Ulcers.*

These are of two kinds: the first arises immediately on the part to which the virus is applied; the second is constitutional, and appears on some other part: hence they are respectively termed, *primary* and *secondary*.

The former, which are termed *chancres*, may appear on any part where the cutis is thin enough to permit the absorption of the virus: the glans penis, the prepuce, the inner side of the labia, the nymphae, the commencement of

the vagina, the nipples, the margin of the anus, the lips, the inside of the mouth, the tongue, the velum pendulum palati, and the entrance of the nasal fossæ, are frequently affected with primary venereal ulcers. The canal of the urethra is very seldom the seat of chaneres: we have, however, witnessed one very singular instance of this kind. The canal was ulcerated to a great extent, so as to produce a kind of hypospadias. This rendered the person extremely susceptible of the contagion. Although all the vagina and the os uteri are often exposed to the contact of the virus, chaneres on these parts are very rare. The matter of gonorrhœa often produces chaneres; but, applied to the conjunctiva, it causes only an increased morbid secretion. Are not particular vital properties of a part essential to the production of chaneres? These sores rarely appear on the skin, unless it have been previously excoriated.

A few days after the application of the poison, generally from four to ten, sometimes later, a severe itching is felt in the infected part, which is quickly followed by swelling: a little tumour is formed, covered with phlyctænæ; they open, and discover an ulcer, which enlarges. When it has attained a certain size, the lymphatic glands, which receive the absorbents of the part, generally become painful, swollen, and inflamed—sometimes even they suppurate, and become the seat of a new venereal symptom.

The situation of the chanere, and other circumstances, distinguish it from any other sore. Its surface is always greyish; the edges are red, and surrounded by a small inflammatory areola, but they are not swollen or turned back; on the contrary, they are perpendicular to the surface of the part, and are usually irregular.

Caustics and incision were formerly employed in the cure of chanere, under an idea of its being a local disease; but experience has shown that we do not thus prevent the constitutional affection. J. L. Petit followed this practice, and witnessed this result. It is true, that slight canterization quickly heals the chanere, but other symptoms soon appear: hence cauterization is allowable only when the chanere is situated in a part where its progress would be dangerous, and the internal treatment must, at the same time, be rigorously pursued. In all other cases, we should cover the chanere with a relaxing ointment, and wash it with an emollient lotion: afterwards, we may use some slight detergent. The internal treatment must be continued some time after the chanere is healed. Sometimes, after all these precau-

tions, a hardness remains in the seat of the sore : this must be destroyed by exciting inflammation, or, if necessary, supuration ; otherwise it may break out again, and constitutional symptoms may even appear.

As to the general treatment, we may employ mercurial frictions, or corrosive sublimate. In the first case, we should direct at first a drachm, or a drachm and a half, of strong mercurial ointment every three days, until we have used four or five ounces, taking care to avoid salivation. If we employ the sublimate, we should dissolve eight grains in a pound of distilled water, and give a table-spoonful every morning, in a cup of milk and water. The whole quantity of the remedy employed should be from twenty-five to thirty grains. Experience demonstrates that this method, which is the most simple, cheap, and expeditious, but it is also the least certain.

Secondary venereal ulcers appear in a longer or shorter time after the infection, if the treatment have been incomplete. These ulcers appear on the parts where the skin is near to a bone, as on the tibia, the cranium, the sternum, and clavicle ; sometimes also at the junction of the lips, between the toes, on the margin of the anus ; and in each of these parts they have a particular character, of which we shall speak hereafter. They also appear in the mouth, in the velum pendulum palati, and schneiderian membrane.

Secondary venereal ulcers are generally superficial, and confined to the integuments. In this case, they commence by a hard indolent tubercle in the substance of the skin : it slightly inflames, and becomes covered with phlyctenæ, which open, and discover an ulcer. Sometimes the virus exercises its action on the subcutaneous cellular tissue, the periosteum, and the bones themselves, and mortifies all these parts at once. The disease then begins with a severe pain, accompanied with a small doughy tumour adhering to the bone ; the skin inflames, several small ulcers form, and lead to a common cavity in the thickness of the tumour ; the ulcers unite, an eschar separates, and the bone is left bare.

The bottom of these ulcers is generally very irregular, pale, or livid ; their edges are perpendicular to the skin, and ragged. But these characteristics are not always very strongly marked ; nor do other circumstances clear up our doubts ; for ulcers appear after a treatment apparently radical. Under these circumstances, if we apply to the ulcer weak mercurial ointment, provided it be really venereal, it

will soon change its colour, become red, its granulations firm and healthy, its pus laudable, and its edges thin; in fine, the ulcer soon heals.

In 1791, we removed a testicle from a cabinet-maker in the Faubourg St. Antoine, in consequence of scirrhus caused by a slight contusion. The man got well. Soon after, the other testis was removed for a similar cause, and with the like result. Tumours next appeared on several parts of the body; those which formed near a bone, were followed by necrosis. The cranium, the clavicles, the acromion process of the scapula, and the sternum, were severally affected. In some parts, the bones were detached, and the ulcers healed; in others, exfoliation did not take place, and the ulcerations became stationary, even when there was no necrosis. Suspicion of their venereal origin was excited, though there was no decided characteristic of that disease. The patient denied having ever had syphilis, and we supposed the case cancerous. We had him brought to the hospital, and very strictly examined him. He confessed that, in his youth, he had lived with a woman of suspicious character, which induced us to dress the ulcers with mercurial ointment. Under this treatment they improved; the necrosed portions that remained behind soon separated, the ulcers healed, and the poor fellow recovered.

When, by the method we have advised, we discover the venereal nature of the disease, it will be proper to give mercury in a different form from that in which the patient has before taken it.

SECTION II. *Of Scrofulous Ulcers.*

This kind of ulcers is very common in children, and very difficult to cure. We shall not here treat of the general disease.

Scrofulous ulcers may appear on any part of the body; but they commonly affect the lymphatic glands, and the joints.

Scrofula sometimes affects the skin, and causes a superficial ulceration, which furnishes a small quantity of pus, that dries, and forms a crust, sometimes surrounded by an areola of inflammation. The skin, in this case, is deeply diseased; and if cicatrization take place spontaneously, or by art, the scar is irregular and deformed, like that of a deep burn, and one or more bands extend across it. Sometimes scrofula acts upon the subcutaneous cellular tissue, and produces a cold abscess, the opening of which, although tardy,

occasions an ulcer: the skin is then thin and detached, unless the abscess be opened in season. The lymphatic glands, especially those of the neck, inflame, and suppurate; their tissue is destroyed, and the opening of the abscess forms an ulcer. Lastly, serofula produces caries, especially of the short bones, and the articular surfaces of the long bones, whence fistulous ulcers result.

A serofulous ulcer may be known from any other, by its occurring in persons of a fine and delicate skin, and lively complexion; in whom the cellular tissue is lax, and the flesh soft; of small stature, or tall and thin; in whom the knee, and joints of the hands and feet, are enlarged, the alæ of the nose swollen and shining, the lower jaw large, and the teeth diseased. To these circumstances we may add the slow chronic character of the ulcer, the paleness and bloated appearance of its granulations, the thinness of its edges, and the serous and caseous nature of the pus.

Scrofulous ulcers often get well at the age of puberty. At this period we frequently see the swelling of the glands subside, exfoliation take place, caries change to necrosis, and cicatrization follow. But, except at this salutary crisis, no spontaneous cure can be reasonably expected; we have nothing to hope but from the most assiduous employment of a proper regimen and internal remedies, seconded by local applications.

In the treatment of scrofulous ulcers, we should, if possible, place the patient in an elevated, pure, dry, and rather warm situation: his clothing must be dry, and comfortable. The patient must take moderate exercise, and be amused. His diet must be chiefly animal, rich, and easy of digestion; with sweet, bitter, and aromatic vegetables: but unfermented farinaceous food, and milk, are improper. Old wine and brandy are useful.

Bitter medicines, tonics, antiscorbutics, mercurials, chalybeates, and occasional purgatives, are proper. Of late, the muriate of barytes has acquired a high character for the cure of serofula; but it is a very active medicine, and requires great caution in its use. It seems, indeed, to have lost part of its reputation; so has the extract of hemlock, boasted of by Storck. Dry aromatic frictions, cold bathing, especially in the sea, and the action of heat, are very useful.

The local treatment would be inefficacious without the above-named remedies. When the ulcer is superficial, like a simple excoriation, and a crust is formed, the application of cerate will generally cause it to separate, if there be an

inflamed circle around it ; in other cases, it is better not to remove it. If, however, after the general health is re-established, the ulcer remain uncured, it is necessary to destroy it by caustics. After this it soon heals.

If a serofulous ulcer succeed to a cold abscess in a lymphatic gland, the swelling which remains may be discussed by plasters, alkaline and hydro-sulphureous baths. In this case, the skin is generally thin, and requires to be cut away.

The fungous granulations of serofulous ulcers are often diminished by internal remedies. It is proper, however, to touch them occasionally with the nitrate of silver ; but we must be careful not to use the caustic too freely, lest we destroy so much cellular tissue as to cause a very deformed cicatrix.

If a serofulous ulcer be connected with a carious bone, all we can do is to wait the completion of the process of exfoliation, and keep open the fistulous orifices. If, however, the local disease be so severe that the patient becomes hectic, and sinks, we must no longer delay amputation, provided there be no other serious local affection ; for, if there were, an operation would only accelerate the death of the patient.

SECTION III. Of Herpetic Ulcers.

These appear generally on healthy skin ; but sometimes the herpetic virus affects ulcers, which suddenly become stationary, after having promised a speedy cure.

This disease is sometimes hereditary, and sometimes acquired. Numerous causes may produce it ; the venereal disease and serofula sometimes assume its garb. A derangement of the digestive functions, especially of those of the liver ; the suppression or diminution of perspiration ; the long-continued use of acrid, salt, or spiced aliments, and living in a hot climate, are among its most frequent causes.

The effects which it produces on the cutaneous tissue are various, and these varieties may be considered as so many successive degrees.

Sometimes there is only a slight affection of the rete mucosum, that produces a mortification of the cutis, which becomes yellow, and falls off in small scales, or in powder ; whence this kind of the disease has been called *farinaceous herpes*. It is always circumscribed, and of a pretty regular circular form.

There is another species of herpes, in which, within a circumscribed part of the skin, small pimples appear, from which an ichorous acrid matter oozes out, that dries, and forms crusts. The pimples are surrounded by areolæ of inflammation, which run into each other; the crusts in like manner unite, and the whole surface is covered with a continuous inflammation and crust. Occasionally, instead of small pimples, we see superficial chaps, attended with the same phenomena. In both varieties, the skin is thicker and harder than in its natural state.

In a third species, the pustules are much more extensive, the ulceration is deeper, and spreads so far as to affect the whole surface, forming a sore, the bottom of which is unequal, and its edges ragged: the colour of the ulcer varies, furnishes a thin, yellow, acrid matter, and is surrounded by a circle of inflammation. This has been called the *knowing herpes*, on account of the severe itching and stinging which attend it; but the same thing occurs, in a lesser degree, in the other species.

When an ulcer is affected with herpes, its edges become red, and covered with pimples, such as we have described; the granulations at the same time become pale, large, indistinct, and flabby; the pus also becomes thin, serous, and acrid.

Herpes, especially if of long standing, is difficult to cure. Hereditary herpes is very intractable. That which arises from a known accidental cause, from syphilis, or serofula, is most easily cured.

In slight and recent herpes, local applications alone will effect a cure; but it is always prudent to give internal remedies at the same time.

If herpes be connected with serofula or syphilis, we must direct a treatment suitable for these diseases; if it arise from disorder of the digestive organs, we should employ diluents. The juice of chicory, alkalies, bitters, sulphur, antimony, calomel, and the hydro-sulphureous mineral waters, are employed with advantage; at the same time, the patient must live upon white meats, fresh eggs, plain boiled fish, ripe fruits, and leguminous plants. A milk diet, if the stomach will bear it, is highly useful; it has sometimes cured herpes that has resisted every other treatment. Moderate exercise, dry friction, and the use of flannel drawers and shirts, are very beneficial.

Fatty substances, and baths, are very useful in allaying the itching; but, after an internal treatment, the sulphur or citrin ointment, lead or lime water, the phagedenic wash,

or a solution of sublimate, are most advantageous. Ambrose Paré covered, with a blister, the face of a young lady, which was rendered so hideous by this disease, that she was forbid to enter a church. Sometimes it may be even necessary to cauterize the whole affected surface.

SECTION IV. *Of Scorbatic Ulcers.*

These ulcers are one of the symptoms of scurvy. They are either exclusively the effect of the general disease, or have been produced by some other cause, and become subsequently affected by it.

Scorbatic ulcers are characterized by the general symptoms of scurvy. They appear on persons who have made long voyages, or who live in cold, damp, and marshy places, or in cellars; who have suffered afflictions, or been badly nourished. The patients are languid, their limbs painful, covered with ecchymoses, and small red spots like flea-bites; the eyes heavy, the face pale, the gums soft, brown, and bleeding on the slightest pressure, sometimes ulcerated; the teeth are black and loose, the breath fetid; the ulcer itself is of a dark brown colour, fungous, and not painful, easily bleeding, and discharging a putrid or bloody sanies. But it often happens that the symptoms of scurvy are much more equivocal; we should, therefore, examine if the patient have been exposed to any of the remote causes of the disease.

In the treatment of these ulcers, the patient should be placed upon a diet of acid vegetables, and those which contain the most azote. If we allow animal food, it should be the white meat of young animals. Aromatics, generous wine, and spirituous liquors, are highly useful. The most useful internal remedies are acid and bitter drinks, beer, cider, lemonade, and especially bark. In a short time the disease will begin to moderate, the appearance of the ulcers will improve, the granulations will become hard, and the suppuration healthy. We should then employ tonic applications, such as styrax, or a decoction of bark. We shall not here treat of cancerous ulcer, as we have already said enough on that subject.

CHAPTER IX.

Of Fistulæ.

BY the term *fistula* is meant a narrow ulcer, more or less deep, in the form of a canal, and continued by a local cause.

We shall treat, 1st. Of fistulæ which are continued by the thinness of the skin under which they pass ; 2d. Of those which are continued by a loss of cellular substance and the mobility of the parts ; 3d. Of those which are kept up by the presence of a foreign body ; 4th. Of those which are connected with caries of the bone, or the mortification of a cartilage, tendon, or aponeurosis ; 5th. Of those which are produced by the perforation of a reservoir, or excretory duct ; 6th. Of those which communicate with an internal cavity ; 7th. Of those that are attended with callosities.

ARTICLE I.

Of Cutaneous Fistulæ.

These differ in no way from cutaneous ulcers, except in their form, and in the situation of the opening.

Fabricius Hildanus and Marvides are the only authors who have described this kind of fistula ; notwithstanding which, it is very common, especially where scrofula prevails. It is easily known by the brown colour of the skin over the fistula, and by examination with a probe.

When the bottom is higher than the orifice, and the skin is not extremely thin, we may endeavour to excite adhesion by irritating injections, such as a weak solution of potash, or alkohol ; but this rarely succeeds. We must then divide or remove the thin skin along the course of the fistula : where the skin is extremely thin, it is always necessary to remove it. Thus we convert the fistula into an ulcer, which only requires to be touched with caustic.

ARTICLE II.

Of Fistulæ continued by the want of Cellular Tissue and the Mobility of the Parts.

An abscess that destroys the cellular tissue of parts which are plentifully supplied with it, and which are very loose and moveable, seldom fails to produce a fistula. This is especially the case with abscesses in the axilla, and on the outside of the rectum. If the patient be very lean, the difficulty is increased, because the space which separates the parts, by the destruction of the cellular tissue, is greater.

Perfect rest, and compression, when it is practicable, are naturally indicated in the treatment of these cases ; but the patient can seldom be cured until he becomes fat ; the increase of cellular tissue then brings into contact the sides of the fistula much more exactly than any process of art. We have seen a young man, who had, for a long time, a fistula in the axilla, consequent to a large abscess in that part : nothing succeeded in curing it, until he went to the country, and grew fat on the use of milk. Patients in hospitals, after the operation of lithotomy, often have urinary fistulæ, which cannot be cured until they become strong and fleshy.

ARTICLE III.*Of Fistulæ kept up by the Presence of Foreign Bodies.*

These often arise from gun-shot wounds, or wounds from glass, or other brittle bodies. Splinters of bone, needles, or urinary calculi, may also produce fistulæ.

The extraction of the foreign body, if possible, is plainly indicated. If, however, we cannot remove it, we must be content with irritating the part, and leaving the rest to nature. After some time it will be removed by the process of ulceration.

ARTICLE IV.

Of Fistulæ continued by Caries.

Caries of a bone produces inflammation and suppuration of the adjacent soft parts; the abscess opens, and a fistula is formed.

When a bone is threatened with caries, it becomes excessively painful. Soon afterwards a tumour forms, which adheres to the bone itself. It is of moderate size, soft, and painful: it contains purulent matter. When it opens, a fistula is formed. The matter is serous, fetid, and communicates a black stain to linen. The orifice of the fistula, and the parts about it, are brown. If we introduce a probe to the bone, we find it rough, soft, and easily penetrated by the instrument. If, however, a carious bone be deep seated, and the orifice of the fistula far from the seat of the disease, we can only form our diagnosis from the rational signs, which are far from being certain.

The fistulæ which arise from diseased cartilages, are to be treated in the same manner as those which arise from caries, and which will be treated of under the head of *caries* itself.

When a fistula is kept up by the mortification of a tendon or aponeurosis, we must wait until nature separate the dead part.

ARTICLE V.

Of Fistulæ continued by the Perforation of a Reservoir, or Excretory Duct.

When a reservoir or excretory duct is perforated, the secreted humour passes through the preternatural opening. We distinguish three kinds of this fistula: 1st. A simple solution of continuity by an external cause. 2d. A solution of continuity with loss of substance. 3d. A solution of continuity with obliteration of the excretory duct. 4th. That which results from ulceration produced by an internal cause.

1st. Nature makes continual efforts to unite divided parts; the constant presence, however, of the secreted fluid, prevents this process. Notwithstanding this difficulty, the parts

frequently re-unite without the assistance of art, as we see in wounds of the bladder, the urethra, or an intestine; however, it is generally necessary to draw off the fluid, and not suffer it to escape through the preternatural opening. But what shall we do when the canal is totally divided? A cure rarely takes place, unless it be favoured by a very particular disposition of the parts, as when a small intestine is divided. In other cases, as in the instance of the duct of the parotid gland, the wound remains fistulous.

2d. Gangrene often produces perforation of reservoirs, or excretory ducts, with loss of substance. This is what happens to the intestines, in strangulated hernia; to the bladder, from a tedious labour; and to the urethra, from urinary infiltrations. These fistulæ are very difficult of cure; all that can be done is, to divert the fluid to some other channel; and, if the loss of substance have been very great, the cure is impossible, or even dangerous. Thus we can rarely cure urinary fistulæ, and incontinence of urine, consequent to a tedious labour, wherein the pressure of the head of a child has produced mortification of the vagina, and fundus of the bladder, to a considerable extent. For the same reason, a stereoraceous fistula, and preternatural anus, are very intractable diseases. The cure is always followed by a considerable diminution of the diameter of the intestine; the passage of the fæces is intercepted, either wholly or in part, and the intestine is exposed to rupture.

3d. All excretory ducts have a tendency to become narrow, by which the passage of the secreted fluid is retarded; the part before the stricture becomes distended, and at length either ruptures or ulcerates. The passage of the secreted humour into the cellular tissue forms an abscess and fistula. A spontaneous cure, in this case, can never take place. We must endeavour to remove the stricture; but it is very liable to return; and if the abscess have produced a loss of substance, it is commonly incurable.

4th. Abscesses, followed by fistula, sometimes take place about excretory ducts, without any diminution of their diameter. In this case, the ulceration is produced by an internal cause; of course, the principal indication is to cure the internal disease. Scrofula often produces fistula lacrymalis in children.

The fundamental indication, in the treatment of fistulæ arising from a perforation of an excretory duct, is to keep open the canal, and to draw off the secreted fluid from the preternatural passage. On this principle, stylets, bougies,

and grooved and elastic probes, are useful. But, if a radical cure be impossible, we must allow the secreted fluid to pass where it is least inconvenient. Thus we often form internal lachrymal and salivary fistulæ, preternatural anus, &c.

ARTICLE VI.

Of Fistulæ which communicate with an Internal Cavity.

Wounds of the frontal and maxillary sinuses are often followed by fistula, because these cavities contain an open space, and their sides cannot adhere to each other, so as to take the place of the lost substance. When the fistula is concealed, as in the case of the maxillary sinus, no inconvenience results : if, however, it be apparent, we must remedy the deformity by an obturator.

The opening into the chest, in the operation of empyema, sometimes becomes fistulous, and is prevented from healing by the vitiated and diseased secretion of the pleura : the action of air increases the evil, and gives rise to hectic fever ; and, perhaps, by rendering the operation more injurious than useful, the cure of such a case is placed beyond the powers of art. Probably it would be useful to discharge the matter from time to time, taking care to prevent, as much as possible, the access of air in the interims.

ARTICLE VII.

Of Callous Fistulæ.

The observations we have made on callous ulcers, are equally applicable to callous fistulæ. Any permanent cause of irritation may give to fistula this character, which is by no means an essential symptom, but only an occasional circumstance. The older surgeons were frequent witnesses of these cases, from the scrupulous manner in which they introduced, into every sore, their tents and pledgets, which constantly excited such irritation as to produce a callous state of the parts : hence their views of this subject were erroneous. After the parts have remained callous for some time, it is necessary to cut them away. Thus we form new

surfaces, and produce the necessary degree of inflammation for re-union. It is, moreover, necessary sometimes to eauterize the course of the fistula, especially in cases of long standing, and in which the mouth of the fistula has become covered with a cicatrix. When the eschar separates, the parts are in a favourable situation for healing.

More extended details would be displaced in an article in which diseases are considered only in a general manner. We shall consider this subject more particularly in treating of diseases in the order of their anatomical situation.

TRANSLATOR'S NOTES TO VOLUME I.



NOTE A, p. 2.

IT does not appear certain that the insulation of the flexor tendon of a finger affected with whitlow is a positive proof of its want of susceptibility to inflame. Many analogous instances appear in other parts of the body, from which no similar conclusion can be drawn: thus the femoral artery is often seen running through a psoas abscess, and as completely insulated as the tendon in the case cited. A sloughing bubo, an infiltration of urine into the cellular tissue, and, still more frequently, chimney sweepers' cancer, often remove every vestige of the scrotum, while the testicles remain entirely unaffected: inflammation of the conjunctiva never reaches the dermoid parts about the eye; the inflammation of a blister to the chest, never extends to the pleura, or lungs; nor does an issue near a joint, communicate disease to the articular cartilages, or bones. All these cases, and many more might be adduced, and that which Baron Boyer has cited, appear to be more properly referable to a law of the animal economy, by which it is impossible, under most circumstances, for inflammatory action to pass from one part to another, contiguous to it, and of different structure.

On the other hand, disease is very readily communicated over a large surface, or extent of parts of similar organization. We have numerous examples of this, in affections of the internal surface of the bladder from gonorrhœa; in the action of suppositories, which increase the secretion of the whole intestinal canal; in the extensive inflammation of the bowels, from strangulation of a small portion of gut; in the erysipelatous affection of the face, that often arises from a wound of the scalp, &c.

The reader will judge for himself how far this view of the subject leaves the author's doctrine unsupported. It is not our intention to digress into theoretical speculation; at the same time, we cannot avoid remarking, that the argument of the succeeding paragraphs appears equally specious. Is it not easy to perceive that the destruction, by gangrene, of the cellular tissue of tendons, "which insinuates itself into the interval of the fasciculi," must necessarily involve the tendon itself in the general destruction, and that exfoliation must ensue?

NOTE B, p. 51.

From this masterly chapter on abscesses, we, who are accustomed to derive all medical knowledge from Great-Britain, may receive two important pieces of information.

That onanism, a vice happily rare in this country, though perhaps less so than is generally believed, is a very common cause of psoas abscess. appears not to be stated by any English writer; and, so far as my observation extends, the fact is entirely overlooked, both by British and American surgeons. From an observation of the pernicious effects of this unnatural vice, more extensive, I hope, than can ever be made in this country, I am fully convinced of the entire justice of our author's remarks on this subject.

From the air of candour which appears in this chapter, and indeed in every other part of Baron Boyer's writings, we cannot hesitate to believe that he was the inventor of the method of treating abscesses in the manner here recommended; and which is, in every respect, similar, except, perhaps, in its greater degree of refinement, to that first proposed in Great-Britain, by that truly scientific surgeon, Mr. John Abernethy, and of which the latter gentleman is commonly believed to be the first discoverer. Our author does not mention the period at which he at first adopted the practice in question; it appears probable, however, from the date of the cases cited, that it was at least before the commencement of the present century. So far as my information extends, Mr. Abernethy's proposals for the same treatment were first made at a subsequent period. It cannot be doubted, however, that he was truly a discoverer of this great improvement.

It is certainly painful to reflect upon facts of this nature, in which we see so strongly exemplified the unhappy influence of national animosities, in restricting the progress of science: at the same time, it must be pleasant to every American to reflect upon the impartiality and candour with which our profession, in this country, receives and adopts the suggestions and improvements of other nations.

The fact, of this method of treating abscesses having been discovered and well received in the two countries, independent of each other, is another strong proof of its utility.

We are not prepared to speak as to the utility of applying cupping-glasses, in order to prevent the possibility of the entrance of air through the puncture, nor could we do it, without being led into a prolix discussion of the much contested question, Whether air exert a noxious influence on suppurating surfaces, and especially if it be productive of those constitutional symptoms, and the ill-conditioned nature of the discharge, which follow the opening of an abscess which is not immediately healed? The application of a cupping-glass in the manner recommended, is, however, at least an innocent, if not an useful part of the operation.

NOTE C, p. 56.

I am indebted to Dr. Hallock for the following account of a remarkable case of psoas abscess, which occurred in the person of his relative, Dr. Sowle, aged twenty years.

In the winter of 1811-12, he had a severe illness from the measles, and a violent attack of pneumonic inflammation which followed it, and from which he only partially recovered. During the affection of his chest, he took nearly two drachms of calomel in alterative doses. He remained feeble and emaciated, and had symptoms of chronic rheumatism in the right hip; his right ankle also swelled, and continued extremely painful and tender to the touch; his bowels were extremely irritable, especially when he took mercury; he had symptoms also of inflammation of the bladder, and a frequent discharge of muco-purulent matter.

In the fall of 1814, in attempting to get into a carriage, he was sensible of straining the psoas muscle and right hip. Considerable pain and soreness followed, which were soon changed to a dull uneasy sensation in the lumbar region and right hip, with an inclination to draw the right knee towards the body, and to sit with the right leg across the other. These symptoms he considered rheumatic.

In February, 1815, he discovered a small tumour on the right thigh, under Poupart's ligament, which he mistook for femoral hernia. The tumour rapidly increased in size, and in a few weeks, when I was called to see Dr. S. in consultation with Drs. Cock and Mott, it had acquired the size of a twenty-four pound ball, and had descended more than half way down the thigh.

Dr. S. was advised to have the tumour opened, after the manner recommended by Mr. Abernethy. This, however, was deferred until the patient would go into the country. At the end of three weeks the tumour was punctured; twelve quarts of a whey-like fluid, with small flocculi, were discharged in about eight days.

The opening remained fistulous, and the constitutional symptoms became severe. A new orifice formed at the most prominent point of the abscess.

After some weeks, matter began to be discharged *per urethram*. More than two quarts were evacuated in this way. The sores appeared to be healing, and the constitutional symptoms diminished, so as to give hopes of recovery; but a new collection appeared in the left groin, and the patient sunk under the profuse discharge which ensued, three months from the first appearance of the tumour under the right Poupart's ligament.

A case occurred some time ago in this city, in which a favourable termination followed the discharge of pus by the urethra.

NOTE D, p. 97.

The possibility of re-uniting a part entirely separated from the body, has been the subject of much discussion; Professor Richerand seems even to doubt that any actual re-union took place in any of the experiments of Mr. Hunter, or those which Hunter copied from Duhamel. He considers that the adhesion of the cock's testicle to the abdomen of a hen, is by no means decisive; * "they are," says he, "foreign bodies, which irritate the peritonæum, cause an exudation of lymph, and pro-

* Hunter, et plusieurs autres après lui, ont expérimenté que les testicules d'un coq, mis dans le ventre d'une poule, s'attachent à la surface des viscères, et contractent des adhérences avec quel'un d'entr'eux. Ce fait ne prouve nullement la possibilité de réunir une partie entièrement séparée du tout. Les testicules introduits dans la cavité abdominale, sont de véritables corps étrangers dont la présence irrite le péritoine: de cette irritation mécanique naît une inflammation suivie d'une exsudation lymphatique qui les unit faiblement. L'organe séminal, quoique renfermé dans un être vivant, quoique réchauffé par la chaleur vitale, n'en meurt pas moins privé de sucs; il diminue, se flétrit, son intérieur se décompose, et tombe à la longue dans une foute putride qui peut devenir nuisible à l'animal, sujet de l'expérience. La transplantation d'une dent saine dans une alvéole vide, n'est pas un fait plus concluant; elle n'y prend pas véritablement racine, comme le croit le vulgaire, seulement elle s'y trouve mécaniquement retenue par l'union des gencives qui en embrassent le collet, et par le resserrement de l'alvéole qui se moule sur le corps introduit. L'adhérence de l'œuf humain à un point quelconque du péritoine, dans le cas de conception extra-utérine abdominale, ne fournit pas d'argument plus décisif. Vivifié par l'acte de la fécondation, cet ovule fournit son contingent de vitalité, et lorsque sa présence a irrité un point du péritoine et produit dans cet endroit le développement du réseau vasculaire, il se fait également en lui un travail propre à établir l'adhérence.

J'ai tenté de résoudre, par la voie expérimentale, le problème qui nous occupe, et des essais réitérés n'ont pu me conduire à cette solution. Je coupai le bout du nez à un chien, et je le rappiquai aussitôt à la surface saignante; quatre points de suture l'y fixèrent; il fut impossible d'y joindre le secours des bandages et des emplâtres agglutinatifs; l'animal se débarrassoit bientôt de cet appareil incommode: le sang coula d'abord en abondance, parce que plusieurs vaisseaux assez considérables, et qui se trouvent dans l'adossement des cartilages, furent coupés. Cependant l'hémorragie cessa après la réunion; le bout du museau gonfla, et par le moyen de cette tuméfaction, la portion rappiquée se trouvoit étroitement collée à la surface dont elle avoit été séparée; le chien nettoyoit la plaie avec sa langue. Au quatrième jour, la portion détachée dans laquelle il ne s'étoit fait aucun travail, offrit des indices de mortification; on coupa les ligatures, et la plaie, avec perte de substance, guérit en quelques jours, continuellement léchée par l'animal qui en opérât ainsi la détersion.

Tout le monde connoît l'expérience dans laquelle on coupe l'ergot d'un coq pour le transplanter sur sa tête; cette partie cornée adhère bientôt au crâne, lorsqu'on l'ente en quelque manière, en faisant une petite plaie à la surface de cette boîte osseuse. Si la possibilité de la réunion existe dans les cas où une partie est entièrement séparée du corps, elle doit surtout s'offrir dans les organes dont la structure est la plus simple, c'est-à-dire, dont la substance plus homogène se compose de la réunion d'un moins grand nombre de tissus simples. Les parties fibro-cartilagineuses de l'oreille, du lobe du nez et de ses ailes, ressemblent aux végétaux par la simplicité de leur organisation, comme par le peu de développement de leurs propriétés vitales. La putréfaction s'empare plus lentement de ces organes, que moins de sucs abreuvent, tandis qu'elle altère et décompose les autres, avant que la nature ait pu travailler efficacement à leur réunion. Ainsi donc, l'observation de Garengeot, quoique l'on puisse raisonnablement douter de son authenticité, l'expérience de l'ergot du coq qui se nourrit et croît sur la tête de ce volatile, comme lesreffs des végétaux, avec lesquels les parties cartilagineuses et épidermoïques du corps des animaux ont une grande analogie sous le rapport de la nutrition, autorisent à tenter la réunion d'un organe de cette espèce, lorsqu'il est totalement séparé. — *Necrographie Chirurgicale, par Richerand, 3e Edit. Tom. I. page 7.*

duce a feeble union of the parts; but the foreign body at length wastes, becomes decomposed, and falls into a putrid solution, injurious to the animal upon which the experiment has been made." But this is not a just account of Mr. Hunter's experiment; for, in two instances, the specimens of which I have seen in the museum of the Royal College of Surgeons of London, the testes had not, by any means, become decomposed, and there were evident proofs of their vascularity and vitality.

M. Richerand regards the transplantation of teeth as a fact not more conclusive than the adhesion of the testes. "It is," says he, "simply retained mechanically, by the growth of the gums and the contraction of the socket;" in a manner similar, we presume, to that in which a stone is often enveloped in the trunk of a tree. It cannot be doubted that this obtains in many, even the majority of instances; but one well attested fact to the contrary, overthrows this doctrine. It is well known that teeth, after having been transplanted, do sometimes become the seat of pain, and undergo such morbid changes, as evidently show that the functions of circulation and absorption are restored to them.

Mr. Astley Cooper has a specimen, in which vascular union had taken place between the comb of a cock and the membrane of a tooth. The membrane lining the cavity of the latter, is filled with injection received from the vessels of the cock.

The wonderful stories of *Taliaeotius* and *Garengot* have been often ridiculed by modern surgeons; but many instances have recently occurred, which leave not the least possibility of doubt that parts, entirely detached from the human body, do occasionally re-unite, even under circumstances which would seem not altogether favourable to the process of adhesion.

In the *Edinburgh Medical and Surgical Journal* for October, 1814, we find the following interesting Paper from Mr. Balfour.

Mr. B. after remarking that, in most cases where parts have been almost entirely detached from the living body, especially in the operation of *Taliaeotius*, they receive very little support from the small remaining medium of connexion, gives the following cases, and the affidavits in support of them.

' CASE I.

' About eleven years ago, Mr. Gordon, surgeon, now, I believe, in India, after having conversed with me for some time one day, in my shop, upon going out, shut the door smartly after him, without perceiving any body near it. Unfortunately, one of my sons, a boy of about four years and a half, diverting himself on the outside, had one of his hands in the groove of the hinge side of the door. I was shocked with a wild scream that I heard upon the door being shut; and still more so, when Mr. Gordon came in, carrying the boy in his hands, stretched, from agony, as upon a rack. The points of three of his fingers were completely separated, with the exception of a slight attachment of skin, which barely suspended the parts. The points hung at right angles when the fingers were extended. The point of the index was cut off at the middle of the nail, the fore-finger a little above the nail, and the ring-finger at the root of the nail. The wounded surfaces were necessarily much bruised, but

the fingers were, nevertheless, cut so perpendicularly, that, unless I had seen it, I could not have believed a door could have done it. With the assistance of Mr. Gordon, the innocent cause of the accident, I instantly replaced the parts, with but little hopes, I confess, owing to the degree of contusion of the wounded surfaces, of re-union taking place. But I was so shocked at the idea of the boy's hand being mutilated for life, that I hesitated not a moment to put the powers of nature to the test. On the sixth day after the accident I removed the bandages, when I found adhesion had taken place, to the unspeakable joy of Mr. Gordon, the boy, and myself. The skin and nails came off all the three fingers, but were afterwards renewed; and the cure was so complete, that a narrow inspection was necessary to discover any difference between the fingers of the one hand and those of the other. There was, indeed, no difference to be perceived, but a slight scar on the left side of the ring-finger, at the root of the nail. This case I certainly would have published at the time it occurred, but on Mr. Gordon's account, who, though not the smallest blame was attributable to him, suffered more anxiety and distress of mind than I did myself, and never liked to hear the subject mentioned. I trust he will now excuse me for mentioning him by name, having no other motive for so doing, than the establishment, beyond the possibility of contradiction, of the truth and accuracy of the above statement. Mr. John Moffat, accountant of Excise, Mr. Alexander Milne, surgeon, now on board the *Norge*, 74, and my servants, were likewise witnesses to the facts. The boy died of the scarlet fever, a year and a half after the accident; and but for the following case occurring, which, to most, I am sensible, will appear much more interesting and decisive, that of my son would never have been recorded.

‘ CASE II.

* On the 10th day of June last, two men came into my shop, about eleven o'clock forenoon, one of whom, George Pedie, a house-carpenter, had a handkerchief wrapped round his left hand, from which blood was dropping slowly. Upon uncovering the hand, I found one half of the index wanting. I asked him what had become of the amputated part? He told me he had never looked after it, but believed it would be found where the accident happened. I immediately despatched Thomas Robertson, the man that accompanied the patient, to search for and bring the piece. During his absence I examined the wound, and found that it began near the upper end of the second phalanx, on the thumb side, and terminated about the third phalanx on the opposite side. The amputated piece, as measured by the patient himself, was an inch and a half long on the thumb side, and an inch on the other. The wound was inflicted in the cleanest manner, by one stroke of a hatchet, and terminated in an acute point.

‘ In about five minutes, as nearly as I can guess, Thomas Robertson returned with the piece of finger, which was white and cold; and I remarked to Dr. Reid, who was present, that it looked and felt like a bit of candle. Without the loss of a moment, I poured a stream of cold water on both wounded surfaces, to wash away the blood from the one, and any dirt that might be adhering, from the other. I then applied.

with as much accuracy as possible, the wounded surfaces to each other, expressing a confident expectation that re-union would take place.

' I endeavoured to inspire the patient with the same hopes, by detailing to him the success I had in my son's case, which, for the reasons already mentioned, was to me quite decisive of the question, Whether or not parts entirely separated from the system would re-unite? All this was heard by the patient with a very apparent distrust. But I could do no more than tell him, that, if re-union did not take place, no harm could ensue from the attempt; and that, if it did, a great deformity would be prevented. I informed him, that unless pain or fetor, or both, should occur, I would not remove the bandages for a week at least; directed him to keep his forearm slung, and not to think of any kind of work. At last he entered so far into my views as to promise punctual obedience. He called on me next day, when he felt no particular uneasiness, but remarked, that the wound had not altogether given over bleeding. Assuring him that there was nothing in that, desired him to call on me every day; but did not see him again till the 4th of July! Concluding, from his absenting himself without assigning any reason, that he was one of those, too frequently to be met with in the lower ranks, who go from one medical man to another, just as their fancy strikes them, or as they happen to be advised by some of their foolish and ignorant neighbours, and whose ingratitude to any practitioner is in exact proportion to the good he does them, I suspected he had fallen into bad hands, and that I never would hear more of him. On the 2d of July, however, a gentleman called on me, and asked if I recollected a man who had got a finger struck off, about three weeks before, to have come through my hands?

' I told him I recollected perfectly well; that I was filled with indignation at the fellow's unreasonable and ungrateful conduct; and that I was just about setting on foot a search after him, not having informed myself either of his name or place where he was employed, at the time he applied to me. The gentleman said he would save me the trouble, for he could give me an account of the man.

' The accident happened on the 10th of June, and, on the 12th, the patient, under the influence of the ridicule of his acquaintances, for giving the least credit to my assurances that re-union would take place, applied to another practitioner. This gentleman, I am informed, on being told the object I had in view in replacing the piece of finger, represented the impropriety of any other person intermeddling with it. But, prepossessed with the belief that he carried about a piece of dead matter only, tied to the stump of his finger, the man insisted on having the bandages removed, which was done accordingly. Thus were nearly rendered abortive any attempts at the re-union of the parts, and the profession deprived of a fact, which, as demonstrating the wonderful powers of nature to repair injuries, is inferior in importance to none in the annals of the Healing Art. But, fortunately, nature had been too busy for even this early interference to defeat her purpose—ADHESION HAD TAKEN PLACE.

' In consequence of the information I got from the gentleman who called on me on the 2d of July, I found out the patient on the 4th, when re-union of the parts was complete. The finger, in fact, is the handsomest

the man has, and has recovered both heat and sensation. In the progress of the cure the skin was changed, and, soon after the accident, the nail fell off; but I have not the smallest doubt that it will likewise be renewed.

‘ From the information obtained, not only from the patient himself, but from those present when the accident happened, I am satisfied that upwards of twenty minutes must have elapsed before the parts were replaced. For the patient did not apply to me *immediately* upon receiving the injury; he waited on the spot till a great number of his fellow-workmen, separated in different apartments of a large building, came to see and condole with him on the occasion. The word *immediately*, in his affidavit, must therefore be understood as so qualified.

‘ I have thought it proper to subjoin the affidavits of George Pedie, Thomas Robertson, and Dr. Reid, to the principal facts and circumstances of Pedie’s case, that no doubt might remain of their truth and accuracy. For “ it must be confessed that instances of re-union among parts which had been entirely separated, are very rare in the human body; so rare, indeed, that most practitioners still treat with disbelief and ridicule the few instances which have been put upon record.”* These affidavits are still more necessary to convince people who are not of the medical profession, but to whom the knowledge and belief of such facts may be useful. Numbers of such having heard an imperfect account of Pedie’s case, have called upon me to ascertain the truth; but I have never yet met with one who expected me to confirm the facts, of the *entire* separation and *complete re-union* of the parts.

“ I, GEORGE PEDIE, house-carpenter, declare, That, on the 10th day of June last, when at work in the Advocates’ Library, I accidentally struck off the finger next the thumb of my left hand, at one stroke, with a hatchet: That, accompanied by Thomas Robertson, foreman of the work, I immediately went to Dr. Balfour, who, as soon as he saw what had happened, asked where the bit of finger was that had been struck off? That I said I did not know, but believed it would be found where the accident happened: That Dr. Balfour requested Thomas Robertson to go and bring it as quickly as possible: That Thomas Robertson went, and returned with it in about five minutes: That Dr. Balfour immediately washed both it and my bleeding finger with cold water, and replaced the piece that had been struck off, and bound it up: That Dr. Balfour said he expected it would adhere, because he had been successful in a similar case eleven years ago, having replaced three of one of his sons’ fingers that had been cut off by accident, and which completely united: That I had no reason to go to any other than Dr. Balfour, but that I did not believe the part of my finger that had been cut off would re-unite, and that I was laughed at by all my acquaintances for ever expecting that it would: That, when the dressings were first removed, which was on the 12th of June, re-union of parts was found to have taken place.

* Dr. Thomson’s Lectures on Inflammation, page 239.

And I declare, that the merit of the cure belongs exclusively to Dr. Balfour. All which I declare to be truth.

" (Signed)

GEORGE PEDIE.

DUNCAN COWAN, J. P.

" *Edinburgh, 18th July, 1814.*

" *Edinburgh, 19th July, 1814.* Compeared Thomas Robertson, mentioned in the preceding declaration, who being examined, declares conform to the preceding witness *in omnibus*. And this is truth.

" (Signed)

THOMAS ROBERTSON.

DUNCAN COWAN, J. P.

" I, PETER REID, physician in Edinburgh, declare, that I was witness to the facts and conversation stated in the above declaration by George Pedie; that I have this day examined his finger, and find that complete re-union has taken place.

" (Signed)

PETER REID, M. D.

DUNCAN COWAN, J. P.

" *Sworn before me, at Edinburgh, July 26, 1814.*

" From the above details many questions naturally arise, any one of which I am far from pretending satisfactorily to answer. It is impossible, however, to dismiss such a subject without hazarding some observations.

" What, then, is the process which nature follows in re-establishing a connexion betwixt the animal system, and a part that has been entirely separated from it? It is agreed upon, as the result of observation, however inexplicable the facts may be, that when two recently divided surfaces, both of which are still connected with the system, are applied to each other, with a view to immediate adhesion, or re-union by the first intention, a layer of gluten is first interposed between them. It is reasonable to suppose, that both surfaces contribute equally to the formation of this layer, which, soon after, is seen to be penetrated with blood-vessels. These vessels, however, are not unconnected, in any stage of their existence, with the surfaces. They do not begin in the substance of the layer, and advance to the surfaces; they begin at the surfaces, and advance towards each other; or, more properly speaking, they are the blood-vessels which had been divided, now elongated, through the medium of the organizable fibrin, for the purpose of re-uniting the parts. Not so with parts that have been entirely separated from the system, and in which circulation has ceased altogether. The fibrin, in this case, must be effused from one surface only—that connected with the system. The vessels of this only can be elongated; and those of the separated part must be nearly passive in the process of re-establishing circulation. The separated part must be considered in a state of suspended animation, still possessing excitability. When new blood comes in contact with the open mouths of its vessels, it is probable that it is absorbed by capillary attraction. This new blood, being the proper and natural stimulus to its own vessels, must excite the dormant vessels to action; and upon this action must depend the connexion that is formed between them and the vessels projected

from the living surface. Circulation between the surfaces being thus established, must be gradually extended through the whole part that had been separated, by the *vis a tergo*, and the action of its own vessels.

'Analogous to this is what happens to persons who are recovered from drowning. Though in them all the functions are suspended, the body is not dead; the principle of vitality still remains. It is, indeed, difficult absolutely to say when this principle is extinguished; at least, nothing short of the formation of new combinations can warrant the conclusion. Thus, though the body may have been a considerable time immersed in water, and is to all appearance dead, if the circulation of the blood can be restored, by the gradual application of heat, friction, and artificial respiration, it becomes reanimated, and is restored to the exercise of all its functions.'

'Extract of a Letter from Mr. Bailey, of Thetford, Jan. 30, 1815.

"I was lately called to an accident which happened to a labouring man at Croxton, a village near Thetford, who, in attending a chaff machine, worked by a horse, entangled his middle finger with the knives, by which the first phalanx was separated completely. He brought it to me, pale, and nearly cold. I was willing to try how far union might be effected, and, after cleansing the parts, I re-applied them accurately, and secured them by plasters and small pieces of cards, by way of splints. I desired the man to call in a week's time, fully expecting to find the end of the finger mortified; but, to my astonishment, re-union had taken place; pulsation was felt at the end of the finger, and its colour was healthy; the end felt numb to him when he touched it; the nail has come away, and I have pleasure in saying it is quite well, and requires no more attendance."—*London Med. and Phys. Journal*, March, 1815.

These cases prove what Professor Richerand and many others deny, viz. that re-union even of soft parts entirely separated from the body may take place, and that putrefaction is by no means so rapidly induced as to prevent this process—and establish, beyond the possibility of doubt, the propriety of attempting re-union in all similar cases.

NOTE E, p. 103.

For one of the most useful improvements in modern surgery, we are indebted to our countryman Mr. Baynton, now residing at Bristol, England. It was published in a small pamphlet, entitled, "A new Mode of curing old Ulcers of the Legs."

The following extract contains the most material parts of Mr. B.'s observations:—

'The parts should be first cleared of the hair, sometimes found in considerable quantities upon the legs, by means of a razor, that none of the discharges, by being retained, may become acrid and inflame the

skin, and that the dressings may be removed with ease at each time of their renewal; which, in some cases, where the discharges are very profuse, and the ulcers very irritable, may perhaps be necessary twice in the twenty-four hours; but which I have, in every instance, been only under the necessity of performing once in that space of time.

‘The plaster should be prepared by slowly melting, in an iron ladle, a sufficient quantity of litharge-plaster or diachylon, which, if too brittle when cold to adhere, may be rendered adhesive by melting half a drachm of resin with every ounce of the plaster; when melted, it should be stirred till it begins to cool, and then spread thinly upon slips of smooth porous calico, of a convenient length and breadth, by sweeping it quickly from the end held by the left hand of the person who spreads it to the other, held firmly by another person, with the common elastic spatula used by apothecaries; the uneven edges must be taken off, and the pieces cut into slips about two inches in breadth, and of a length that will, after being passed round the limb, leave an end of about four or five inches. The middle of the piece so prepared, is to be applied to the sound part of the limb opposite to the inferior part of the ulcer, so that the lower edge of the plaster may be placed about an inch below the lower edge of the sore, and the ends drawn over the ulcer with as much gradual extension as the patient can well bear; other slips are to be secured in the same way, each above and in contact with the other, until the whole surface of the sore, and the limb, are completely covered at least one inch below, and two or three above, the diseased part.

‘The whole of the leg should then be equally defended with pieces of soft calico three or four times doubled, and a bandage of the same, about three inches in breadth and four or five yards in length, or rather as much as will be sufficient to support the limb from the toes to the knee, should be applied, as smoothly as can be possibly performed by the surgeon, and with as much firmness as can be borne by the patient, being passed first round the leg at the ankle joint, then as many times round the foot as will cover and support every part of it except the toes, and afterwards up the limb till it reaches the knee; observing that each turn of the bandage should have its lower edge so placed as to be about an inch above the lower edge of the fold next below. If the parts be much inflamed, or the discharges very profuse, they should be well moistened and kept cool with cold spring water, poured upon them as often as the heat may indicate to be necessary, or perhaps at least once every hour. The patient may take what exercise he pleases, and it will be always found, that an alleviation of his pain, and the promotion of his cure, will follow as its consequence; though, under other modes of treating the disease, it aggravates the pain, and prevents the cure.’

The success of this treatment, in the great majority of old callous sores, has been testified by every writer who has treated of this subject.

Mr. Baynton dispenses with the application of the cold water in many instances, and I am disposed to believe it by no means an essential, or even a useful, part of the treatment, in most cases.

But a much more important point, in which surgeons, who have had ample opportunities for observation, differ from Mr. Baynton, relates

to the effect of exercise. Mr. B. it will be seen, considers exercise as a means of promoting, rather than of retarding, the cure. I have constantly witnessed bad effects when the patient went about, especially if he took long walks. I do not mean to say that we ought, in every case, to confine patients with sore legs to the sitting or horizontal position, but I believe most men of experience will bear me out in advising that the limb should be kept elevated as much as possible, (except in very slight cases,) until the process of cicatrization is nearly completed. Mr. Home's observations on this subject, however, point out, in a very clear manner, the propriety of the patient's using exercise, when it is not found to prevent the sore from healing.

‘As the great object in the healing of an ulcer is to have the new flesh, by which it is filled up, as strong in its living powers as possible, that it may not afterwards break out again, every thing that can conduce to that end is deserving of attention. It is reasonable to conclude, that, in the growth of animal substances, as of vegetables, where there is a rapid increase, the parts growing are weaker than where it is slow; and if the granulations, which are already growing beyond their strength, have this rapidity increased by partial removals, they must in reality be rendered weaker than they were before. If this reasoning be just, which there is reason to believe it is (since the observations on which it is founded are taken from practice), the treatment of granulations ought to be regarded in a point of view that has hitherto been little considered. Their growth ought to be kept back, in an early stage of their formation, by such resistance as they are just able to overcome; which will, at the same time, retard their increase, and allow them to acquire strength by their own actions; for new-formed parts in a living body are strengthened in proportion to the action they are obliged to exert. This, however, is confined within certain limits; for if the actions are increased beyond the real strength of the parts, the absorbents remove them altogether; and an attempt is made to produce a new growth of granulations, strong enough to support the actions required of them. This they are sometimes unable to accomplish, and the ulcer remains nearly stationary, till the stimulating application is removed.

‘It is upon this principle that the pressure made by tight bandaging is found so useful in this kind of ulcer; and it is from the same cause that those ulcers which heal while the patient is walking and using exercise, are less liable to break out again, than those which are healed under the circumstances of rest and perfect quietness.

‘I have dwelt the longer upon the necessity of attending to the strengthening of granulations at their first formation, from finding that, after they are once formed, they do not appear capable of becoming stronger in the same degree, but give way under the slightest increase of motion in the parts, even after they have been allowed what might be considered a sufficient time to acquire strength, and the ulcer itself has been completely healed. We have daily proofs of this weakness of granulations, in all the stages of their growth, in our public hospitals. When a patient is first received with an ulcer in a very disturbed state, from improper treatment, without any distinct appearance of granulations, un-

der the application of a poultice, the surface will frequently become clean, and granulations will rise up in every part: these will increase, and appear to be strong and healthy (when superficially examined) while the patient remains in bed; but as soon as he gets a little better, and walks about, the ulcer spreads; the motion of the limb being greater than the granulations can support; on which account they are absorbed, and taken back into the constitution. If the patient be kept in bed, the ulcer will heal, and he may leave the hospital perfectly well; but as soon as he returns to his usual exercise, the granulations, too weak to support themselves, give way, and the ulcer breaks out again, and becomes nearly of the same size as at the first.

‘As this is one of the most common species of ulcer to which soldiers are liable, it is of the utmost importance that military surgeons should be made acquainted with the cause why so many of them are so liable to break out again, that they may avoid this consequence, and, by their mode of treatment, enable their patients to return to their duty as soon as possible after the ulcer shall be healed.

‘Ulcers on the leg may be, in the first instance, of the truly healthy kind, but, from their size, the parts towards the centre may be so long kept from skinning, that the granulations may become weak; and, when they have risen to the surface, may remain stationary, without showing any disposition to form skin. When this is the case, they generally, after a day or two, acquire a fresh growth, and become luxuriant.

‘In the treatment of such ulcers it is, therefore, proper to attend to this circumstance; and whenever it is seen that the granulations, though come to the proper height, do not form a thin semitransparent pellicle upon their surface, they are to be considered as weak parts, and treated accordingly. The simplest and best mode, where the constitution has no peculiarity which forbids it, is pressure: this may be made by a piece of thin lead over the dressings, and will be assisted by a tight bandage on the limb, which, by compressing the parts, makes the circulation through the veins less tardy than when the parts are left to themselves.’

I have employed the thin calico which Mr. B. advises the plaster to be spread upon, but the plaster is apt to soak through it. New muslin, with a thick glaze, answers the purpose much better.

Professor Thompson makes the following judicious remarks:—‘Instead of carrying them [the straps] completely round the limb, by which they often act like tight ligatures, or garters, it is, in most instances, sufficient to make them enclose only about two-thirds. When properly applied in this way, they act chiefly upon the cutaneous surface, and occasion no retardation to the general venous circulation in the limbs to which they are applied. In practice, I have repeatedly found the straps, carried completely round the leg, injurious, but by no means so always, nor perhaps even in a plurality of cases. The straps also have, in some patients, a tendency to excite inflammation of the skin; and, in this case, if continued, produce excoriation, and even small ulcers. This state is sometimes prevented by bathing the skin surrounding the ulcer, at the time of dressing, with sugar of lead water. When it occurs, the straps must be given up for a time, and the inflammation removed by poultices.

But it is not in old ulcers of the legs only that the adhesive straps are useful. We have, perhaps, no external curative means in surgery, the emollient poultice not excepted, that is of more universal application in all cases of healthy suppurating wounds and sores. When supported by proper bandaging, these straps bring the edges of wounds and ulcers together; they repress, without irritation, the excessive growth of granulations; they diminish serous and puriform discharges; and they give a firm support to the parts to which they are immediately applied.

‘ When the surface of the ulcer remains callous, we touch its raw surface every second or third day, at the time of dressing, with a bit of sulphate of copper, or wash it with a diluted solution of nitrate of silver. In the truly callous and indolent states of this ulcer, these applications often promote, in a very remarkable degree, the processes of granulation and cicatrization. Bandaging with the roller, which is begun from the points of the toes, is particularly necessary, and is sometimes useful, in that variety of callous ulcer which is accompanied with the enlargement, or, as it is termed, varicose state of the veins of the leg. Some of the ulcers, however, in this state, are found not to heal, be the mode of treatment adopted what it may, unless the varicose state be removed.’

NOTE F, p. 120.

Soon after the middle of the last century, some of the distinguished members of the Royal Academy of Surgery became sensible of the ill consequences resulting from the frequent and almost indiscriminate use of plasters and ointments. French surgery owes much to the labours of Du Quesnay, Faure, and Champeaux; the last received the prize of the Academy for the best memoir on the abuse of these applications.* M. Faure first discovered the utility of radiated heat in the cure of ulcers. He advises that a heated iron, or burning coal, should be held, for a few minutes, as near the ulcer as the patient can bear, without extreme pain. The heat, he remarks, is very efficacious; perspiration takes place from the circumference of the ulcer, its edges become softened, and suppuration quickly succeeds. The bottom and sides of the ulcer being thus drained, it soon becomes healthy, and cicatrizes after a few applications of this remedy.†

The use of burning coals in this manner, is by no means uncommon in France at the present day; in fact, the plan recommended by M. Faure is now pursued at the Hotel Dieu. My own experience of the effects of this remedy is very limited; I have, however, known three cases of chronic ulcers, two of which were scrofulous, either entirely cured, or remarkably improved, by it.

The heated body is alternately approximated to, and removed from, the ulcerated surface. If a severe heat be applied, more or less bleeding

* Les Prix de l'Academie Royale de Chirurgie, tom. iv.

† Les Memoires de l'Acad. Royale de Chirurg. Edit. in 8vo, tom. xv. p. 375

will be the consequence. We all know the efficacy of warm poultices, embrocations, &c. Ought not this to teach us to regard radiated heat as a powerful remedy?

The more immediate object of this note is to insist very strongly upon the justice of the author's remarks, in regard to the bad effects of unctuous applications. The indiscriminate use of these substances produces many evils, a part of which only M. Boyer has here pointed out. There is much justness in the following remarks of M. Champeaux :—'Fatty and unctuous applications readily become rancid, especially when applied to an inflamed part; they irritate the nerves, close the pores, stop perspiration, and augment the heat and volume of the part, by the presence of a great quantity of fluids; and thus they often lead to gangrene.'* M. C. cites a case from Juncker, of a woman who died two days after her husband had applied butter to her face, which was inflamed.

Whence arises, let me ask, the necessity or the advantage of touching with caustic the granulations of almost every ulcer? Every one is ready to answer, because they become pale, weak, and relaxed. Is this state natural to the granulations? If it be, why increase their tendency to become bloated, by relaxing applications, such as ointments and poultices? If this state be not natural to granulations (and I am convinced it is not, except under particular circumstances), why should we produce it by these remedies?

It is well known that Hippocrates, Galen, and Paulus Egineta, reprobated the use of unctuous applications to ulcers. In a matter of this nature, which is simply a subject of observation, the authority of either of these writers is at least equal to that of the first British surgeons of the present day, whose practice is very generally followed in this country. There is authority enough in favour of a different practice: reason and experience have united to restrict the use of unctuous applications, in the hands of the French and some other continental surgeons, to very narrow limits, and great success attends the employment of stimulating applications in a liquid form.

I am unwilling to detract from the merit of our countryman Mr. Baynton, but I cannot forbear asking, if much of the success which follows the application of the adhesive straps, may not arise from this circumstance, that, during their use, unctuous applications are necessarily suspended?

NOTE G, p. 135.

I cannot give a better exposition of the futility of the practice of the French surgeons, in wounds and diseases of arteries, than by offering the following extracts from Mr. Jones's valuable work on Hemorrhage.

'An impetuous flow of blood, a sudden and forcible retraction of the artery within its sheath, and a slight contraction of its extremity, are the

* *Prix de l'Acad. Royale de Chirurg.* tom. iv. p. 657.

immediate and almost simultaneous effects of its division. The natural impulse, however, with which the blood is driven on, in some measure counteracts the retraction, and resists the contraction of the artery. The blood is effused into the cellular substance between the artery and its sheath, and passing through that canal of the sheath which had been formed by the retraction of the artery, flows freely externally, or is extravasated into the surrounding cellular membrane, in proportion to the open or confined state of the external wound. The retracting artery leaves the internal surface of the sheath uneven, by lacerating or stretching the cellular fibres that connected them. These fibres entangle the blood as it flows, and thus the foundation is laid for the formation of a coagulum at the mouth of the artery, and which appears to be completed by the blood, as it passes through this canal of the sheath, gradually adhering and coagulating around its internal surface, till it completely fills it up from the circumference to the centre.

‘A certain degree of obstruction to the hemorrhage, which results from the effusion of blood into the surrounding cellular membrane, and between the artery and its sheath, but particularly the diminished force and velocity of the circulation, occasioned by the hemorrhage, and the speedy coagulation of the blood, which is a well known consequence of such diminished action of the vascular system, most essentially contribute to the accomplishment of this important and desirable effect.

‘A coagulum, then, formed at the mouth of the artery, and within its sheath, and which I have distinguished in the experiments by the name of the external coagulum, presents the first complete barrier to the effusion of blood. This coagulum, viewed externally, appears like a continuation of the artery; but, on cutting open the artery, its termination can be distinctly seen, with the coagulum completely shutting up its mouth, and enclosed in its sheath.

‘The mouth of the artery being no longer pervious, nor a collateral branch very near it, the blood just within it is at rest, coagulates, and forms, in general, a slender conical coagulum, which neither fills up the canal of the artery, nor adheres to its sides, except by a small portion of the circumference of its base, which lies near the extremity of the vessel. This coagulum is distinct from the former, and I have called it the internal coagulum.

‘In the meantime the cut extremity of the artery inflames, and the vasa vasorum pour out lymph, which is prevented from escaping by the external coagulum. This lymph fills up the extremity of the artery, is situated between the internal and external coagula of blood, is somewhat intermingled with them, or adheres to them, and is firmly united all round to the internal coat of the artery.

‘The permanent suppression of the hemorrhage chiefly depends on this coagulum of lymph; but, while it is forming within, the extremity of the artery is farther secured by a gradual contraction which it undergoes, and by an effusion of lymph between its tunics, and into the cellular membrane surrounding it; in consequence of which these parts become thickened, and so completely incorporated with each other, that it is impossible to distinguish one from the other. Thus, not only is the

canal of the artery obliterated, but its extremity also is completely effaced, and blended with the surrounding parts.

‘ When the wound in the integuments is not healed by the first intention, coagulating lymph, which is soon effused, not only attaches the artery firmly to the subjacent and lateral parts, but also gives it a new covering, and completely excludes it from the external wound, which then goes on to fill up and heal in the usual manner.

‘ The circumstances now described are observed also in the inferior portion of the artery, or that which is supplied with blood by anastomosis: with this difference only, that its orifice is generally more contracted, and the external coagulum is much smaller than the one which adheres to the mouth of the superior portion of the artery, or that from which the blood flows in its direct course from the heart.

‘ From this view of the subject we can no longer consider the suppression of hemorrhage as a simple or mere mechanical effect, but as a process performed by the concurrent and successive operations of many causes: these may briefly be stated to consist in the retraction and contraction of the artery; the formation of a coagulum at its mouth; the inflammation and consolidation of its extremity by an effusion of coagulating lymph within its canal, between its tunics and in the cellular substance surrounding it.

‘ And we may conclude that, except in some rare instances, in which the strong retraction and contraction of a divided or lacerated artery prevent hemorrhage altogether, a languid state of the circulation is necessary for the accomplishment of the natural means by which the hemorrhage is stopped. These means may be divided into the *temporary* and *permanent*: under the former head we may include the three first of the above-mentioned causes, whilst the effusion of lymph constitutes the permanent; yet even these can be distinctly traced only for a certain time, in consequence of other changes which the artery gradually undergoes. Its obliterated extremity no longer allowing the blood to circulate through it, the portion which lies between it and the first lateral branch is no more distended and excited to action as formerly, but gradually contracts, till at length its cavity is completely obliterated, and its condensed tunics assume a ligamentous appearance. At the same time, the remarkable appearances at the extremity of the artery are undergoing a considerable change; the external coagulum of blood, which, in the first instance, had stopped the hemorrhage, is absorbed in the course of a few days, and the coagulating lymph, which had been effused around it, and had produced a thickened and almost cartilaginous appearance in the parts, is gradually removed, and they again appear more or less completely restored to their cellular texture.

‘ Nor are these all the changes which the artery undergoes; for, if examined at a still later period, the ligamentous portion is found to be reduced to a filamentous state, distinguishable from the surrounding cellular membrane only by being somewhat coarser; and thus the obstruction which commenced at the extremity of the canal, terminates in the complete annihilation of the artery to the first lateral branch.

‘ But, long before this final change is accomplished, many of the lateral branches of the superior and inferior portions of the artery have become very much enlarged, and have established, by frequent anastomoses, a free and ready communication between these disunited parts of the trunk. The small branches, by whose immediate inosculation these anastomoses are formed, appear to have undergone the principal changes; they are not only proportionably more enlarged than the large branches of the limb to which they belong, and very considerably larger than the corresponding branches of the other limb, but have also become longer, and, being confined within their former space, assume a beautifully tortuous and serpentine course, in order to accommodate themselves to it.

‘ The circulation appears to be carried on as perfectly and vigorously by these anastomosing branches in the limb, the main artery of which has been divided, as in that in which the artery is entire; the inferior part of the divided artery, and all its branches, being found fully equal in size to the corresponding part of the trunk and branches of the artery of the opposite limb which has not been divided: and hence we may conclude, with the celebrated Mr. Hunter, that “vessels have a power of increase within themselves, both in diameter and in length, which is according to the necessity, whether natural or diseased.”

‘ I shall now make some further observations relative to the external and internal coagula of blood, and the intermediate one of lymph, which, if introduced before, would have too much interrupted the detail of the process. And first of the external coagulum—

‘ Its particular figure and extent vary according to the manner in which the wound has been inflicted. If the artery, its sheath, the vein, and nerve accompanying it, have all been completely divided, the figure and extent of the coagulum will depend on the relative retraction of the artery to that of the sheath, which varies in different animals, and according as the artery has been more or less detached from the surrounding cellular substance.

‘ If the *artery alone* be divided, the anterior part of its sheath having been opened longitudinally, the coagulum which then forms at the mouth of the artery, varies from a quarter to near half an inch in length, and differs from the form of the artery only in being sometimes slightly conical at its extremity; which, when the integuments have been sewed up previous to the division of the vessel, is turned forward, and is continuous with a large globular portion of coagulum, which being confined by the integuments alone, lies over it and the extremity of the artery. This appearance of the external coagulum may readily be accounted for, from the circumstance of the sheath not having been divided so as to admit of its retraction; whereas the complete division of the artery allows it to retract even within the part to which the wound of the sheath has extended; and, accordingly, that portion of the coagulum which lies within the entire part of the sheath, assumes the form of the artery; while the portion of sheath which has been opened, being deprived of the support of the artery, and of its tension, is more or less disposed to collapse, and will necessarily give a conical appearance to the portion of

coagulum formed within it; and thus it is that the lower extremity of the external coagulum is sometimes conical: but when the integuments have been sewed up previous to the division of the artery, in consequence of the impediment which that circumstance affords to the exit of the blood, even this flaccid portion of the sheath becomes fully distended with blood, and, of course, the conical form of the external coagulum is prevented.—I have been thus particular in explaining these circumstances, because I wish it to be clearly understood, how a slight difference in the manner of performing the experiments may occasion a variation in the appearance of the parts when examined; and if, in repeating experiments on this subject, any deviation from the account here given should be observed, I am convinced it will be satisfactorily accounted for, by attending to the manner in which the experiment is performed in both instances.

‘ The extent, and indeed even the formation of the *internal* coagulum of blood, depend very much on the distance from a lateral branch, at which the division of the artery has taken place. Thus, if it is divided about a quarter of an inch beyond a branch, there will scarcely be formed any coagulum of this description; for the effusion of lymph at the cut extremity of the artery, is in general sufficient to form a coagulum which extends a little way within the artery, and then the space between the extremity of the coagulum of lymph and the lateral branch is so short, that no internal coagulum of blood can be formed, at least none worth mentioning. In some instances I have found a small lamina of coagulated blood, not thicker than a six-pence, lying on the coagulum of lymph; the extremity of which, in these cases, generally projects a little beyond the extremity of the artery, and extends further within its canal than merely the surface by which it adheres; which circumstance seems to depend on a larger quantity of lymph being effused than is necessary to fill up the canal of the artery as far as the inflammation extends on its internal surface, and the superfluous quantity not coming in contact with an inflamed surface, and the blood being constantly driven between it and the sides of the artery, it forms no adhesion, but projects a little within the canal. It is probable that the compression which the lymph undergoes from the gradual contraction of the extremity of the artery, may also contribute to this effect.

‘ But when the division of an artery has taken place at some distance from a lateral branch, a long conical internal coagulum is then formed, whose base is situated towards the extremity of the artery, and, in general, it adheres partially, at the circumference of its base, to the internal surface of the artery, close to the coagulum of the lymph.

‘ The internal coagulum of blood, however, does not fill up the cavity of the artery throughout the whole of its extent; and though conical, it has often the appearance of not having been formed at once, but by the successive coagulation of small quantities of blood. It is very readily distinguished from the coagulum formed by the effusion of lymph from the inflamed extremity of the artery, which is rather brown than white at first, probably in consequence of some admixture of red particles, and which is *principally* characterized by adhering, almost throughout its whole

extent, to the internal surface of the artery; whereas the former, *i. e.* the internal coagulum of blood, although much longer than this of lymph, forms no adhesion whatever, except a slight one at its base, and which seems to be produced by the coagulum of blood being formed while the lymph is sufficiently recent to allow it to stick to it. Although the internal coagulum of blood, when first formed, by no means fills up the canal of the artery, except at its base, yet, in consequence of the contraction which the portion of artery containing it gradually undergoes, after a short time it embraces the coagulum so closely, that they appear to cohere to each other; so that although the greater part of the coagulum, preserving its natural form, may very easily be separated from the artery, yet its internal surface is left of a black colour, as if an external lamina of the coagulum still remained on it. It is also highly worthy of notice, that on examining, at a distant period after these experiments, arteries which (from similar experiments on the corresponding arteries of other animals more speedily examined) we know must have had considerable coagula of blood in them, no coagula should be found in them; but their internal surface is very black, and their external appearance, previous to being cut open, remarkably dark.

‘From what has been said, it appears that, when an artery has been divided at some distance from a lateral branch, three coagula are formed: one of blood, externally, which shuts up its mouth; one of lymph, just within the extremity of its canal; and one of blood, within its cavity, and contiguous to that of lymph.

‘I have called that of lymph a coagulum, because, when the divided artery has been left entirely to itself, there is such a quantity of lymph effused, that, although it is firmly united to the internal surface of the artery, it may be considered as a distinct substance; but, if the cut edges of the extremity of the artery had been kept in contact with each other by pressure, they would have cicatrized, and no coagulum would have been formed; *i. e.* coagulating lymph would not have been effused in such a quantity as to form a mass of a determinate figure.

‘I have already remarked, that when the division of an artery has been made very near to a lateral branch, no internal coagulum of blood is formed: hence we see that the number of coagula varies according to circumstances. But the external coagulum is always formed, and is subject to no other variations than those already described.

‘The internal coagulum of blood contributes nothing to the suppression of hemorrhage in ordinary accidents, because its formation is uncertain; or, when formed, it rarely fills the canal of the artery; or, if it fills the canal, does not adhere to the internal coat of the artery. Hitherto, therefore, I have contented myself with noticing its existence, or pointing out the circumstance which prevents its formation, without ranking it amongst the means which nature employs for the suppression of hemorrhage. But if an artery be lacerated, its internal coat will be torn in many places, in proportion to the degree of violence with which the injury has been inflicted. Under this particular accident the internal coagulum of blood may extend beyond many collateral branches, will fill the canal of the artery, and will adhere to its internal surface wherever it is

lacerated, in consequence of lymph being effused from these several wounds of the internal coat. The internal coagulum may, in this case, avail against a return of hemorrhage.

‘ Longitudinal, oblique, and even transverse wounds of small dimensions, are filled up with coagulating lymph effused from the inflamed edges of the wound in the artery. This lymph appears to be poured out very freely, not only from the artery, but also from the surrounding parts; and hence we find it accumulated around the artery, and particularly over the wound, at which part it forms a more distinct tumour.

‘ But, at the same time, the surrounding parts which have been exposed become inflamed, and pour out lymph, so that the whole surface of the wound is covered by a layer of coagulated lymph, which completely excludes the artery from the external wound. This lymph granulates, and the wound is filled up and healed in the usual manner.

‘ The first effects of the ligature upon an artery are, a complete division of its internal and middle coats, an apposition of its wounded surfaces, and an obstruction to the circulation of the blood through its canal. The artery does not become unusually distended in consequence of this obstruction, principally because the collateral branches afford a passage to the blood, and partly in consequence of the effect which the obstruction to the arterial canal, and the pressure made by the ligature, have in depriving that portion of the artery of the property of accommodating itself to the quantity of blood determined to it—a property which, it has frequently been observed, arteries are endued with, to a certain extent, when entire and free from pressure, and which is beautifully illustrated by the almost immediate enlargement which the collateral branches have been observed to undergo, when a trunk has been tied. From these circumstances it appears, that the enlargement of the portion of the artery, between the first collateral branch and its extremity, is prevented; but it is obvious that there must be a small quantity of blood just within the extremity of the artery, and which is more or less completely at rest; it therefore coagulates, but does not appear, in every instance, to form at once a coagulum capable of filling up the canal of the artery; for, as may be observed in many of the experiments, several hours after the artery had been tied, there was only a slender coagulum formed in its extremity. I am therefore disposed to think, that although the artery cannot accommodate itself to the blood determined to it, yet it undergoes such a degree of contraction, as occasions too much motion in the blood which it contains, to admit at once of its complete coagulation. It is a fact, that, in most cases, only a slender coagulum is formed at first, which gradually becomes larger by successive coagulations of the blood; and for the same reason it is that the coagulum is always at first of a tapering form, with its base at the extremity of the artery. But the formation of this coagulum is of little consequence; for, soon after the application of the ligature, the extremity of the artery begins to inflame; and the wounded internal surface of its canal, being kept in close contact by the ligature, adheres, and converts this portion of the artery into an impervious, and, at first, slightly conical sac. It seems to be entirely owing to the effusion of lymph, by which this adhesion is effected.

that the coagulum of blood, formed within the artery, is sometimes found adhering, by a small part of its *base*, to the extremity of the artery. But whilst the adhesion of the internal parietes of the artery is accomplished, a considerable quantity of lymph is effused between its coats, and among the parts surrounding its extremity; so that, in a very short time, the extremity of the artery is enveloped in lymph, and covered with a layer of it, just as we have seen the punctured artery to be. After a short time, the ligature occasions ulceration of the part around which it is immediately applied; and, acting as a tent, a small aperture is formed in the layer of lymph effused over the artery; through this aperture a small quantity of pus is discharged as long as the ligature remains; and, finally, the ligature itself also escapes, and the little cavity which it has occasioned, granulates, and fills up; and the external wound heals in the usual manner, leaving a considerable thickening and induration of the cellular membrane, extending a little beyond the extremity of the artery.

‘ But since a certain degree of ulceration and formation of pus appear to be the necessary effect of the ligature, and this ulceration takes place as near as possible to a newly cicatrized part; and as it is a well known fact that such parts very readily ulcerate, it is obvious, that every possible means should be employed to prevent the extension of this ulcerative process. Hence we should guard against the accumulation of pus about the extremity of the artery, by such pressure as the parts may conveniently bear, by placing the limb in such a position as will allow a ready exit to the pus, and, in some instances, by the application of sponge.

‘ It is certainly desirable that the ligature should come away as soon as possible, yet I am convinced that great care is necessary in endeavouring to expedite this event. We should always remember, that so long as the attachment of the ligature appears to have any degree of firmness, any force exerted on it (as, for instance, by pulling it rather strongly) must act more or less on the recently cicatrized extremity of the artery, which is not only contiguous to it, but is still in union with that portion of the artery which detains the ligature; for it is the external coat of the artery which hinders the separation of the ligature, partly, in consequence of its undergoing ulceration slowly, and partly, because the ulceration, which takes place in the first portion of the artery, by rendering the ligature loose, diminishes very much its power of promoting ulceration through the rest of the artery. But so long as any portion of this external coat remains entire, it is continuous with the external coat of the newly cicatrized portion of the artery, and therefore, any force exerted on the former, may be extended to the latter. Hence it appears most prudent, that so long as our attempts to draw away the ligature meet with much resistance, they should only be exerted in such a gentle and gradual manner, as may promote ulceration of the part by which the ligature is confined, without endangering laceration of the recently united parts.

‘ The permanent changes which take place in an artery, and in the circulation through a limb, in consequence of the application of the liga-

ture, are precisely the same as those which happen from the division of an artery. The portion of the arterial trunk which has been tied, undergoes a gradual contraction and obliteration to the first collateral branches, and finally dwindles to a mere fibre.

‘ The collateral branches are usually distended, and excited to stronger action, from the moment that a complete obstruction is formed in the trunk, and consequently the commencement of their enlargement may be referred to that period. Their increase of size seems to be proportioned to the exigences of the particular case: thus, if the limb has been amputated, it does not appear to be finally very considerable; but if the limb remain entire, and only the natural course of the circulation be obstructed through the main arterial trunk, their enlargement is much more conspicuous, and is particularly observable in the small inosculating ramifications of the collateral branches, by which the circulation appears to be carried on, after a certain time, as vigorously in the limb, the principal artery of which has been obstructed, as in that which has preserved its natural circulation.

‘ The effects of tying an artery properly appear then to be the following:—

‘ 1°. To cut through the internal and middle coats of the artery, and to bring the wounded surfaces into perfect apposition.

‘ 2°. To occasion a determination of blood on the collateral branches.

‘ 3°. To allow of the formation of a coagulum of blood just within the artery, provided a collateral branch is not very near the ligature.

‘ 4°. To excite inflammation on the internal and middle coats of the artery by having cut them through, and consequently to give rise to an effusion of lymph, by which the wounded surfaces are united, and the canal is rendered impervious; to produce a simultaneous inflammation on the corresponding external surface of the artery, by which it becomes very much thickened with effused lymph; and, at the same time, from the exposure and inevitable wounding of the surrounding parts, to occasion inflammation in them, and an effusion of lymph, which covers the artery, and forms the surface of the wound.

‘ 5°. To produce ulceration in the part of the artery around which the ligature is immediately applied, viz. its external coat.

‘ 6°. To produce indirectly a complete obliteration, not only of the canal of the artery, but even of the artery itself, to the collateral branches on both sides of the part which has been tied.

‘ 7°. To give rise to an enlargement of the collateral branches.

‘ In the account which I have now given of the effects of the ligature on an artery, I have had in view only those instances in which the ligature has been applied on the extremity of a divided artery, or those in which two ligatures have been applied on an artery, at a small distance from each other, and the intermediate portion divided. But, from observation on the human subject, it appears that the effects are different, or at least their accomplishment is much more likely to be interrupted, when one or two ligatures are applied on an artery without any subsequent division of it.

‘ I shall now consider the manner in which the ligature, by its impro-

per form or application, may give rise to secondary hemorrhage. It may with truth be asserted, that that part of surgery which relates to the securing of arteries, obtains a very inadequate degree of attention. Provided that ligatures are ready, their size and form, whether completely flat or irregular, are, I believe, seldom attended to; nor does it appear that the degree of force employed in tying the artery, is often taken into consideration. Some surgeons, wishing to guard against the ligature's slipping off, tie it with very considerable force; while others, apprehensive lest they should cut through the artery, or occasion too early a separation of the ligature, draw it only sufficiently tight to prevent the escape of any blood. Now it appears highly improbable that a broad, flat ligature should make such a wound in the internal and middle coats of an artery, as is most favourable to adhesion; because it is scarcely possible to tie it smoothly around the artery, which is very likely to be thrown into folds, or to be puckered by it, and, consequently, to have an irregular, bruised wound made in its middle and internal coats: and even if it should make a proper wound, yet, by covering a considerable space of the external surface of the artery, it may destroy the very vessels which pass on it in their way to the cut surfaces of the internal and middle coats, and thereby render them incapable of inflaming; nor does it appear that anastomosing branches can supply this defect; for, if the branches which immediately supply the cut surfaces, are bruised and compressed by the ligature, how is the blood from anastomosing branches to enter them? But, admitting that such a ligature makes a proper wound, and that the wound unites, still it may cover that part of the external coat which is directly over the newly united part; and consequently, as soon as it has occasioned ulceration through the external coat, it will produce the same effect on the newly united parts, and, of course, secondary hemorrhage.

‘ If a ligature is of an irregular form, the probability is, that it will cut through the internal and middle coats of an artery more completely at some parts than at others; but, from experiment, it appears that, to induce a sufficient degree of inflammation to occasion an effusion of lymph from the internal surface of an artery, it is necessary that these coats should be completely cut through. This fact does not rest on the authority of one experiment alone, for, in all my experiments with the ligature, which were examined soon after it had been applied, although the internal surface of the artery appeared inflamed a little way above the part at which it adhered, yet in no instance did it exhibit the appearance of lymph having been effused on it, except at the part which had been cut, and the point of adhesion was never more than a line's breadth; in short, the artery seemed to adhere only at its cut surfaces. From these facts I think we may fairly conclude, that, if the ligature does not completely cut through the internal and middle coats all round the artery, adhesion cannot take place between its internal surfaces, and therefore secondary hemorrhage will take place as soon as the ligature has ulcerated through any part of the parietes of the artery, and that it will of course become more frequent and copious as the process of ulceration advances.

‘ The observations which I have here made, will undoubtedly be espe-

ually verified, if such a ligature as I am alluding to, or perhaps any ligature, is applied by an operator, who is particularly careful not to tie the artery tight, lest he should cut through its coats, or occasion too speedy a separation of the ligature.

‘ Another circumstance with regard to the ligature, is its being applied so as to form an oval instead of a circle, by embracing the artery higher up on one side than the other. This, I am aware, will be more or less remedied in the act of tying; but yet, in consequence of an artery being drawn out unevenly with the tenaculum, or, if it be entire, of the cellular membrane being more detached from it on one side than the other, this may sometimes happen; and it is obvious that, in such a case, the cut edges can neither be so justly placed, nor so firmly kept in apposition, as they ought to be; they will, therefore, be more easily torn asunder, and the ulceration produced by the ligature will be much more likely to affect the recently united parts, and produce hemorrhage, if they escape it from other causes. I do not say that a ligature can be tied around an artery so as to form a complete oval, I mean to allude only to the deviation from a circle: now it appears, from what has been already said, that it is only the cut surfaces which unite; any deviation, therefore, from a circle, must be unfavourable to the exact and steady apposition of these parts. I think there can be little doubt, either as to the reality of the ligature being sometimes applied in that way, or as to the tendency of such an application of it to produce secondary hemorrhage.

‘ It may be expected that I should say, of what form the ligature ought to be made, and with what degree of force it should be tied. With regard to the former, I have little hesitation in saying, that I believe it is best to make it round, and very firm. As to the degree of force which should be used in tying it, I shall only observe, that every operator should be acquainted with the force necessary to cut through the internal and middle coats of an artery; but as this force is very slight, and the external coat of an artery is strong enough to allow the ligature to be tied tight, without its being cut through, it is better to tie the artery tighter than is necessary, merely to cut through its inner coats, because we shall thereby more certainly keep the cut surfaces in contact, expedite the coming away of the ligature, and, of course, diminish the risk of the ulceration extending to the newly cicatrized part; nor does there appear to be any reason to fear that the external coat may ulcerate through before the internal coats have adhered, since we see, from experiment, that their union is very soon effected. Instead, therefore, of this apprehension, let us rather direct our attention to keep the limb as quiet as possible, and to guard against every means by which the adhesion may be destroyed.

‘ There is yet another important consideration which it is necessary to notice here; I allude to the slipping off of a ligature. It is well known that this accident has often happened; and it may be adduced in confirmation of the observations which I have offered on the improper and careless application of the ligature; for, however surgeons may endeavour to excuse themselves, by referring it to the violent impulse of the blood, I believe that a candid inquirer into the cause of it, will find a

much more rational and satisfactory explanation, either from the clumsiness of the ligature, which prevented its lying compactly and securely round the artery; or from its not having been applied tight enough, lest it should cut through the coats of the artery too soon: or, finally, from its having that very insecure hold of the artery which the deviation from the circular application, above alluded to, must necessarily occasion. It is obvious that these causes may be variously combined in the same case, and if one be adequate to occasion the slipping off of the ligature, how much more likely is that event to happen when they are so combined?

‘From a variety of facts, I am convinced that, if an artery is tied in the manner which I have suggested, there will be little reason to fear its being pushed off by the impulse of the blood; but if we wish for greater security than that mode of tying can give, we may have recourse to one of the modes of practice formerly recommended by Dionis.

‘The observations which I have hitherto made on secondary hemorrhage, refer to the application of a ligature on the extremity of a divided artery, or to cases in which two ligatures have been applied on an artery, and the intermediate portion divided. I shall now consider the circumstances under which it occurs from an artery that has been tied with a single ligature, without any subsequent division of the vessel. On this subject much has lately been said about the retraction of the artery, to which the secondary hemorrhage has been almost wholly imputed; but, from what I have seen of arteries treated in this way, it appears difficult to conceive how retraction of the artery can have any effect in producing it, or even how it is possible that the artery can retract, when the ligature has been applied immediately around it, without including any of the surrounding parts; for although the ligature produces ulceration of the parts with which it is in immediate contact, yet, long before this process commences, an effusion of lymph has taken place around the parts of the artery near the ligature, and completely confines the artery to, and incorporates it with, the surrounding parts.

‘I hope it will be remembered, that I am only discussing the causes of secondary hemorrhage from arteries treated in this way, as I by no means wish it to be understood that I deny the advantage of an artery being allowed to retract, by dividing it after a ligature has been applied on it. It is well known, however, that many successful operations for aneurism have been performed, by applying a ligature on the artery without any subsequent division of it; and I think it highly probable, that if we could be minutely informed of the circumstances of those cases in which repeated secondary hemorrhages have occurred when the operation has been thus performed, we should find the hemorrhages referable, either to a diseased state of the artery,—to the various means which have been employed for guarding against hemorrhage, by contrivances to compress a large portion of the artery, or for remedying it, if it should occur, by having a loose ligature above that which was tied,—or, finally, to the fear of producing too speedy an ulceration of the artery; in consequence of which the ligature has not been applied sufficiently tight to cut through the internal and middle coats, so as to fit them for adhesion; but, on the contrary, has occasioned a gradual ulceration through the

coats of the artery, and, of course, produced hemorrhage, which has returned with greater violence as the ulceration advanced. To these causes may also be added those which have been suggested, for they will operate at least with equal effect on an undivided artery.

'If these observations are well founded, they certainly have a tendency to show that there is not so important a difference, as far as relates to the production of secondary hemorrhage, between an artery's being tied with a single ligature, and its being tied with two, and divided between them; for the great advantage of the retraction of the divided artery within the cellular membrane seems to be, in a great measure, if not completely compensated, in the case of the undivided artery, by the speedy and profuse effusion of lymph, which takes place over and round the artery at the part which has been tied, and which not only secures the portions of artery for some distance above and below the ligature, but, at first, covers even the ligature itself, which afterwards occasions ulceration through this layer of lymph.'

If any other argument were required to convince the reader how infinitely the French are behind the British and American surgeons in the treatment of aneurism, I might state, what is perfectly well known, that the operation for aneurism, in France, is very generally fatal, while, in the United States and England, it has almost ceased to be regarded as a dangerous resource of art.

NOTE II, p. 148.

The Observations of Dr. Hamilton on the Subject of Tetanus, and the success of his practice in several affections resembling that disease, lead us to believe that the costiveness which takes place in tetanus, is not owing to the opium which is so commonly given to relieve the spasms, but constitutes a part of the disease; and that purgative medicines may hereafter be found to be far more powerful antispasmodics in this complaint, than any of those which are generally employed in the treatment of it. Their great efficacy as antispasmodics, in convulsions, chorea, epilepsy, hysteria, &c. experience has abundantly confirmed since the publication of Dr. H.'s valuable work; and it is perhaps not a little remarkable, that physicians have so long persisted in the employment of a class of equivocal remedies in tetanus, to the almost entire exclusion of cathartics. It certainly seems natural to suppose, with Baron Boyer, that the constipation which is so invariably noticed in this disease, may arise from spasm affecting the muscular fibres of the intestines in common with other parts of the muscular system; and we find that the violence of the pain in the epigastrium (that most pathognomonic symptom of the complaint) is in proportion to the duration of the spasm. The facility of relieving general and violent spasmodic affections, in many instances, by purgative medicines alone, ought certainly to induce us to make a trial of them in this inveterate complaint.

The use of purgative medicines is also very strongly indicated in the

treatment of hydrophobia, since almost all authors agree in mentioning obstinate constipation of the bowels as accompanying that disease, or give such an account of the alvine discharges, when particularly noticed, as would induce us to suspect great derangement of the primæ viæ. Indeed the efficacy of cathartics in this disease, is already, in some measure, established by experience. In an able and ingenious dissertation on this subject, by Dr. Lewis Carlisle, of the state of New-York, the influence which derangement of the alimentary canal has on the symptoms of this disease, and the great utility of employing purgative medicines freely after blood-letting, is clearly deduced from analogy, and a variety of cases, that are selected to show the connexion between the remission of the symptoms and the occurrence of copious alvine evacuations. From a review of the facts he has stated, and the pathological accounts of writers on hydrophobia, we cannot but express our surprise that physicians should have continued to treat this disease also with a variety of inadequate remedies, to the almost total omission of purgative medicines.

NOTE I, p. 157.

The doctrine here laid down, in regard to the re-union of divided nerves, is that which is generally received at the present time; yet it does not seem easy to reconcile it with the fact, that a transplanted tooth, or other part, after having been entirely separated from the body, may become the seat of pain. The celebrated Kosziusko is said to have suffered a division of the sciatic nerve, in the war which preceded the partition of his country; and as he is known to have recovered the use of his leg, it has been asserted that this case established the fact that nerves re-unite after division. But there is strong reason to believe that Kosziusko's lameness was altogether feigned, and that the sciatic nerve was never divided.

NOTE K, p. 202.

I am indebted to Professor Mitchill for the following observations on the venomous snakes of this country. I hope the publication of them will tend to remove some erroneous opinions prevalent on this subject.

' Among the popular errors concerning snakes, none have been indulged to greater extent than those which relate to their number and their venom. I have not been able, as yet, to ascertain more than seventeen species of serpents among us; nor are these poisonous, as is usually supposed. The greater part of them, it is true, have teeth; but these instruments, though capable of drawing blood by penetrating the flesh, are not more injurious than the teeth of a mouse. They may scratch, and wound a little; but I never knew any serious consequences to follow.

‘ There are, however, two species of serpents that are venomous; these are the *true rattle-snake*, and the *bastard rattle-snake*

‘ 1. The true rattle-snake is already well known to naturalists, under the name of *crotalus horridus*. He has four fangs, two on each side of the palate, and a yellowish skin, clouded with dark.

‘ There is a variety of this creature, called the *black rattle-snake*. He is distinguished by darker shades of colour than the preceding, and has, by some, been considered as a different species. I have not hitherto succeeded in procuring the *yellow* and the *black* rattle-snakes, so as to make a comparison that is satisfactory to myself. It is certain that they have both the same dwellings, habits, and manners, at least as far as I have been able to discover; they are equally venomous; and are probably varieties of age, sex, or other circumstances. Time, and further observation, must settle the rest. As it is, we know enough for all the purposes of caution.

‘ 2. The bastard rattle-snake is also familiar to our farmers, and labourers on the soil; but I question whether he is so well known to naturalists. I have, therefore, thought it proper to give him a particular description.

‘ Bastard rattle-snake (*boa crotaloides*), with back diversified with large reddish-brown spots, and sides variegated with a row of irregular blackish spots.

‘ This serpent is likewise known by the names of *chunk-head*, *copper-head*, *pilot-snake*, and *red-adder*; has two poisonous fangs, one on each side of the palate, in the upper jaw; the length is from two to three feet, and upwards; the lines very much resemble those of the yellow rattle-snake; the scuta on the belly are one hundred and fifty-five, and those on the tail fifty-two; the back is composed of chocolate-coloured mottles, overspreading a chesnut-coloured skin; there is a row of blots, irregularly angular, along the sides; the belly is of a dirty yellow; the head is scaly.

‘ The red-adder loves grassy situations, and meadows; and it thence happens, that they who mow the grass, and tend it during its conversion into hay, are poisoned by him more frequently than other persons.

‘ New-York produces no other poisonous serpents.

‘ For the purpose of overcoming a prejudice relative to the serpent called, among our people, the *field-adder* (a species of coluber), I took a living one into my hand, and suffered him to bite me. He writhed his body around my arm and fingers, and fastened his mouth, with all his strength and fury, near the first joint of my thumb. He continued to bite, until I choaked him off, and threw him away. Several of the wounds inflicted by his teeth bled freely. They healed as so many injuries from vegetable prickles or briars.’

NOTE L, p. 247.

Professor Richerand considers malignant pustule as not always a contagious disease; and M. Bayle, in an Inaugural Dissertation, published at Paris in the year 1803, states, that it prevailed epidemically in several villages in the department of the Lower Alps, without any co-existing epizootic malady, and without any animals having died of carbuncle.

NOTE M, p. 272.

Two cases of aneurism cured by the application of ice, are related in the Medical Repository. See *vol. xvii. p. 199, and vol. iii. new series. p. 91.*

NOTE N, p. 280.

This is an incorrect observation; and though perhaps it is not improbable that surgeons will hereafter prefer compressing the artery after the method of Mr. Crampton, yet the danger of cutting through the artery is altogether imaginary.

NOTE O, p. 289.

The importance of keeping the limb warm, after an operation for aneurism, has not been duly appreciated by many surgeons of high standing. It is stated by Mr. Ashley Cooper, in his Lectures on Surgery, that he has seen several cases, in which limbs have mortified from want of attention to the practice here recommended by Baron Boyer.

NOTE P, p. 308.

We cannot but lament that French surgeons have not improved their treatment of aneurism, in consequence of the brilliant and successful operations for aneurism that have been performed, of late years, in Great-Britain and the United States. We take pleasure in stating, that Dr. Post, of the city of New-York, has operated successfully for aneurism of the carotid artery, and for aneurism of the femoral artery, very high up. The last case is here inserted, as well to do justice to the merits of that distinguished surgeon, as to offer an example of what we consider the

best treatment of aneurism, viz. by tying the artery with a single ligature.

' On Tuesday, the 4th of January, 1814, the operation of femoral aneurism was performed in the theatre of the New-York Hospital, by Wright Post, Esq. one of the surgeons of that institution, in the presence of a numerous attendance of practitioners and pupils.

' There were several circumstances in this case which rendered it more than usually interesting. The patient, who called himself Allen, was a vigorous man of colour, in the forty-first year of his age. The disorder of the artery was spontaneous, and could not be referred to any external injury or ostensible cause: its seat was in the upper part of the left thigh. The tumour was of considerable size. The pulsation was very evident: a peculiar whizzing, or thrilling motion, was perceived at each stroke, by the fingers. The swelling had been observed by him about two months before admission; it had gradually and regularly increased. In other respects, he enjoyed a good share of health.

' After his first reception into the hospital, on the 15th of October, 1813, he had been ordered to try the recumbent posture, with rest, and compression to the tumour. This course had not been productive of any substantial benefit: the disease advanced in all directions, becoming prominent, and diffusing itself further around; the artery also was sensibly enlarged, or thickened, for a more considerable distance above the tumour than could be distinctly traced. A consultation was called, and, on examination, no probability of relief appeared, excepting by an operation.

' It was apprehended that this morbid condition of the artery might extend to the iliac bifurcation. It was foreseen that there might be a necessity of dividing the membrane investing the abdominal viscera, of exposing the intestines and omentum, and of inducing inflammation of the peritoneum. Other difficulties were considered, and the attending surgeon determined to encounter them all by attempting the operation.

' Almost a month was lost after the measure had been recommended, before the patient would give his consent. All this time the disease had made its ordinary progress, and rendered the eventual success still more uncertain.

' Dr. Post proceeded to trace the artery with the knife, cautiously from the sac upwards. In this he was restricted by the tension given involuntarily to the muscles of the thigh, in consequence of the pain and irritation; he was also circumscribed by the limits of the aneurismal tumour itself pushing towards the pelvis; it became necessary likewise to counteract the impression made upon the viscera of the belly pressing downwards by the patient's straining, and forcing themselves upon the operator after the peritoneum was opened. But another difficulty occurred, of peculiar moment: there was a thickening of the sheath which binds down the blood vessel to its place. On tracing the external iliac artery towards the point of union with the internal, the disease seemed to cease a little more than an inch below that spot. Here the operator prepared to apply the ligature; but the cellular membranous substance investing the artery had so far partaken of the disease, as to resist the action of

the finger-nail when employed in its separation. In this state of things the thickened envelope was cautiously divided by the scalpel, and the blood-vessel afterwards loosened by the finger. The ligature was then applied by means of the blunt needle and crooked forceps. The artery was so deeply situated, the space between the diseased portion and the fork was so short, and the impediments to a double tying so considerable, that it was considered sufficient to pass the thread around but once. Accordingly, after the knots had been well secured, the event of the operation was permitted to rest upon a single ligature, and upon an artery not divided by the knife. The patient bore it with remarkable firmness. Very little blood was lost. The wound was dressed with strips of sticking plaster and lint. After the administration of a composing draught, and an attempt to procure rest, the condition of the limb was examined.

‘It was observed, that, instantly on applying the ligature, the pulsation in the tumour had ceased. On the succeeding day, with the stillness of the swelling, there was observed to be a very perceptible diminution of it. The thigh, leg, and foot had been nicely covered with flocks of cotton, but they had never grown cold; circulation seemed to be carried on to the extent required to keep them sufficiently warm. This indeed was so remarkable, one might be led to conjecture that the blood, obstructed in its direct passage by the tumour, had forced its way through the internal iliac and the lateral vessels, long before the operation. There seemed to be, from the beginning, a sufficient distribution of blood through the limb for all the purposes of warmth, nourishment, voluntary motion, and a good degree of sensation.

‘The intestines readily yielded to the operation of cathartics and injections. There were no symptoms of peritoneal inflammation; but, for about ten days, a most convulsive and distressing hiccough, with occasional vomiting, harassed the man. The febrile symptoms, at the same time, were very moderate. The pulse was rather small and low. During that time his situation was doubtful; and, in respect to hiccough, wakefulness, anxiety, and exhaustion, very alarming. The nervous system was much more sensibly affected than the vascular.

‘But, in the mean time, the healing of the wound proceeded regularly. On the thirteenth day the ligature came away; the hiccough, vomiting, and more alarming symptoms, subsided; and the greatest distress of which he complained, was a pain in the lower part of the limb, particularly about the foot and toes. Occasionally a numbness, alternating with pain, was felt near the groin.

‘These symptoms, however, gradually abated. The cicatrization of the wound was the completion of surgical art. The circulation through the aneurism was stopped, and the lateral vessels carried a sufficient quantity of blood to warm and nourish the limb. By degrees, the power to employ it for the purposes of voluntariness and locomotion were returning, when the man was found to be infected with syphilis of longer standing than the aneurism. For this he was salivated by quicksilver, and put upon a proper curative course.

‘I examined this man on the 24th of March, 1814, while he was under-

the salivation, and felt the pulsations of the artery on the upper side of the foot; but there was then no motion in the aneurismal tumour. Yet, within forty-eight hours from that time, a beating became perceptible; and, on the 30th, by pressing the fingers gently upon the swelling, I was satisfied of its reality. He, nevertheless, made no complaint of pain or uneasiness; and, on being requested to walk, performed that exercise with more readiness than he had been able to do since the operation.*

The operation of the external aneurism has also been performed, with success, by Dr. Dorsey, of Philadelphia.

Mr. Stevens, of Santa Cruz, has tied, with success, the internal iliac artery.†

Sir G. Blane relates a case, in which even the aorta was obstructed by disease during the patient's lifetime.‡

Improvements in the treatment of aneurism are succeeding each other in rapid succession. An account of a new mode of operating will be found in the Appendix to this volume. I am informed it has been successfully repeated by Mr. Astley Cooper.

NOTE Q, p. 311.

We trust the cases related in the preceding note will fully show how inapplicable these remarks are to operation on the external iliac artery. Dr. Post operated, with success, in a case where compression could not be made above the tumour, so as to suspend the course of the blood.

NOTE R, p. 338.

We imagine our author refers to the disease usually known by the name of *noli me tangere*. The translation is literal.

NOTE S, p. 360.

Compression is not only useful in preventing a return of callous ulcers, but is also an excellent means of cure. We beg leave to refer the reader to Mr. Baynton's observations on this subject, in note G.

* M-d. Repos. vol. ii. new series, p. 196.

† Medico Chirurg. Trans. vol. v

‡ Ibid.

APPENDIX.

THE following case of an extraordinary tumour, the most extraordinary, we believe, on record, will no doubt be read with interest. It was communicated by my friend Dr. Thomas Roper, of Charleston, South-Carolina, to Dr. Mitchill, of this city, and is published in the Medical Repository, vol. iii. new series, p. 72, with a plate.

'The unfortunate individual is a woman of colour, who was born of healthy parents, in Newbury district, in this state. She is of robust form, apparently enjoys good health, and does not exceed thirty-five or thirty-six years of age. When she was two years old, a smooth fleshy excrescence made its appearance over, though unattached to, the left parietal bone, not very remote from its anterior inferior angle. Its increase, though at first slow, has been uniformly progressive. About her tenth year, it is described as having filled up and descended along the temporal fossa. Having become pendulous, its rapid increase and elongation were truly surprising. The eye of this side, with all its appendages and integuments, with great agony to the patient, was drawn from the socket mechanically by its weight; and in the same manner did the ear descend, the integuments of the whole left side of the head and face having relaxed and admitted of their descent. The mouth, and left nostril especially, became also remarkably distorted. Now the immense pendulous flap appears as it were suspended from the integuments of the frontal and parietal bones, and again to have a second attachment from the chin and throat. When the woman is erect, it extends to her knees. I find it to measure three feet three inches from the situation where it originally sprang. At its lower or bulbous extremity, it is rather more than two feet five inches in circumference when uncompressed; just below the chin it is about a foot less in circumference. The ear rests on the left mamma, having descended from its natural position about fourteen or fifteen inches, and it has undergone, at the same time, considerable enlargement and thickening in every direction. The meatus auditorius is still pervious, and a discharge, rather fetid in its nature, constantly distils from it. A probe has been introduced into it, I am credibly informed, full fourteen inches; but the auditory nerve of this ear has for some time lost its excitability to the impression of sounds.

'The most remarkable peculiarity in the history of this case, I think, is the descent of the eye, which has been dragged five inches from the socket. The external canthus being probably first acted upon by the

volume of the tumour, the position of the ciliæ, which is naturally transverse, is now directly longitudinal: they are as large as those of a horse, and usually kept closed. The meibomian glands being very prone to inflammation from slight causes, were, at the time I saw her, affected with violent psoraphthmia. The eyelids have a tremulous movement, resembling winking, which movement is synchronous with the actual winking of the right eye. In separating and looking between them, the organization of the eye does not appear materially injured. Though the optic nerve is so extraordinarily elongated, the poor creature can still discern with it day-light from darkness; and, two years ago, the sight in it, she affirms, was tolerably good. Vision, in the *stationary* or right eye, is perfect.

‘The weight of this great sarcomatous growth has operated a singular change in the form of the inferior maxillary bone; its left half, from the symphysis, being so straightened, that its figure, which, in the natural state, resembles the Greek ν , bears, in this individual, considerable analogy to the gamma inverted, γ . The transverse direction of several of the teeth are consequently completely transposed; and when the finger is introduced into the mouth, a smooth deep pouch, at its anterior part, is felt, usually half filled with saliva, and which, from its extraordinary situation, and its depth, involuntarily called to mind the pouch which hangs from the bill of the pelican.

‘The tumour, when examined, feels like dough, is equable as to its surface, but within contains numerous irregular masses, connected seemingly together by cellular membrane; fasciculi of varicose veins, equal in size to the thumb, may be plainly distinguished involved in the mass; and a few superficial ones divaricate, and meander along its surface. It has no tendency to inflammation or suppuration; and though it formerly did, yet it does not now give her any pain; but, as you may naturally conceive, is extremely inconvenient and oppressive from its great bulk, so that she is obliged to keep it constantly supported in a large sack. The integuments are loose and flaccid, and apparently sound. Though the distention is so considerable, I did not remark the cutaneous papillæ had undergone any notable enlargement. Small tufts of woolly hair have grown from many places over the upper part of the tumour. Its temperature is the same as that of any natural part, and its sensibility very acute, so that she immediately discovers when flies or other insects light upon it.

‘There appears to be a constitutional propensity in this woman to the generation of such tumours; her body generally, but particularly the back of her neck, is covered with a multiplicity of them, of various dimensions. In the latter situation, there is one which has already attained the length of several inches.

‘It is a subject of curious remark, that so great an abstraction of blood as this tumour continually withdraws from the general system, has produced no bodily debility. I was anxious to learn also whether it had any effect on the uterine system. I was informed that the catamenia was ever scanty, and the woman has always lived, and declares she still feels the same disposition to continue, *absque marito*.



‘The annals of surgery afford but few examples of such monstrous productions. I at present remember but one more voluminous—that recorded of Eleanor Fitzgerald. Here the tumour is described to have been the effect of accident, to have sprung from the same situation, to have acquired such prodigious bulk that it hung from the throat and breast like an immense bundle of intestines, *a yard and a half* in length, and, according to the spirited narrator, was an appearance altogether “as wonderful as any thing that ever happened in the human body.” But here, though the volume of the tumour was so prodigious, it appears not to have altered even the lineaments of the countenance; and, when contrasted with the case I have recorded, the small degree of distortion induced is really surprising. In this, and several other points, the case now communicated appears to me more remarkable, nay, more “wonderful,” than that detailed by Mr. John Bell; it is, moreover, another “eloquent example,” strongly impressing that important solemn warning upon practitioners, never to abandon growing tumours, if remediable, to the deceptive expectations of time and nature.

‘The preceding statement I had thus far drawn up, when I discovered that a short account of it had been published, about ten years ago, in the Philadelphia Medical and Physical Journal. But as this work never had any other than a very limited circulation, and the tumour in the interval has undergone considerable alteration, I trust this additional statement may not be deemed by you uninteresting or supererogatory.

‘Ten years ago (according to Dr. Casey) the greatest length of the tumour was twenty-four inches; its fundus in circumference twenty; the descent of the eye, four; of the ear, nine. Should then this woman’s life be protracted for ten additional years (of which there is no improbability whatever), and this tumour increase upon the principle, characteristic of all others, that, the greater the bulk, the greater the stimulus, and consequent determination of blood into it, it will unequivocally be the most voluminous upon record.”—*See the plate.*

‘A new method of operating for the cure of popliteal aneurism has been employed in Dublin, with the most complete success.

“The operation was performed by Mr. Crampton, Surgeon-General at the King’s Military Infirmary near Dublin, on the 15th of October. The femoral artery was laid bare at the usual place, by an incision three inches in length, and *compressed* (but not tied circularly) by a narrow tape, so as completely to obstruct the current of the blood, *with the least possible disturbance to the artery, or injury to its coats.* The ligature was, by a peculiar contrivance, applied in such a manner as to enable the operator to tighten or relax it at pleasure, without interfering with the wound. In two hours and a quarter the ligature was gently relaxed, but not completely loosened: no pulsation in the ham. In twenty-four hours the artery was relieved from all compression; but, as a measure of precaution, the ligature was left in the wound. In forty-eight hours the ligature was withdrawn, and the wound was united by adhesive plaster

"The patient was examined, on the fifth day, by several professional gentlemen. His health was not in the least degree deranged. The tumour, which had decreased by one half, was without pulsation, and nearly incompressible. The temperature of each foot was 84° .

"On the fourteenth day the wound was nearly healed, and the man went about the ward on crutches.

"On the eighteenth day the wound was healed, and the tumour, which could be seen only in the extended position of the limb, was incompressible, and altogether free from pain.

"The advantage of Mr. Crampton's operation consists in its imitating, in the most favourable way, the process of nature in the spontaneous cure of aneurism.

"1st. By interrupting the course of the blood through the ruptured artery, the fluid contents of the aneurismal sac are allowed to coagulate, and the circulation is thrown upon the collateral branches.

"2d. The subsequent obliteration of the artery is effected by a natural process, which protects the patient from the long train of suffering and of dangers necessarily attendant upon the permanent contraction of a great artery, and its separation from the ligature by the process of the sloughing, or ulceration."

It is worthy of remark, that Mr. Larrey secured the arteries on the stumps of amputated limbs, with only a single knot of a ligature, even when they were to be transported soon after the operation. Mr. Larrey never witnessed secondary hemorrhage, for union of the coats of the artery always took place in twenty-four or thirty-six hours. His remarks on this subject, which will be found in the translation of his *Memoirs* by Doctor Hall, do not deserve the sneer that has been cast upon them by some persons in this country, who pride themselves upon their ignorance of French surgery.

Mr. Larrey's views were to procure adhesion of the sides of an artery by the first intention, and for this purpose he kept them in apposition for twenty-four or thirty-six hours. Now the case just related proves, that he anticipated the English surgeon in this improvement.

Mr. Travers has written a very valuable *Memoir* on Hemorrhage, which will be found in the *Transactions* of the Medico-Chirurgical Society, in which he clearly shows that effusion does follow the application of the ligature to an artery in seventeen hours, though that ligature be removed at the end of seven hours; and in this short space of time the cavity of the artery was nearly obliterated.

ERRATA.

- Page 25, line 15, insert *substance* after *cellular*.
— line 5 from bottom, after *through* insert *the*.
26, line 25, for *present* read *presents*.
— line 26, after *periods* insert *it*.
29, line 17 from bottom, for *parotic* read *parotid*.
32, line 4 from bottom, for *parites* read *parietes*.
35, line 15, for *without inward* read *within outwards*.
41, line 20 from bottom, for *light* read *tight*.
53, line 23, for *August* read *September*.
59, line 23 from bottom, for *transverse* read *traverse*.
62, line 2, 3, for *interior* read *exterior*.
81, line 26, for *upon* read *throughout*.
100, line 3, after *broad*, for the comma insert a period.
128, line 3, after *cauterization* insert *compression*.
176, line 18, for *uncommon* read *in common*.
220, line 18 from bottom, for *purgent* read *pungent*.
352, line 1, for *CHAPTER VIII.* read *CHAPTER VII*.
370, line 1, for *CHAPTER IX.* read *CHAPTER VIII*.



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